

MODEL **PRECISION CG BALANCING** **AIRPLANE**

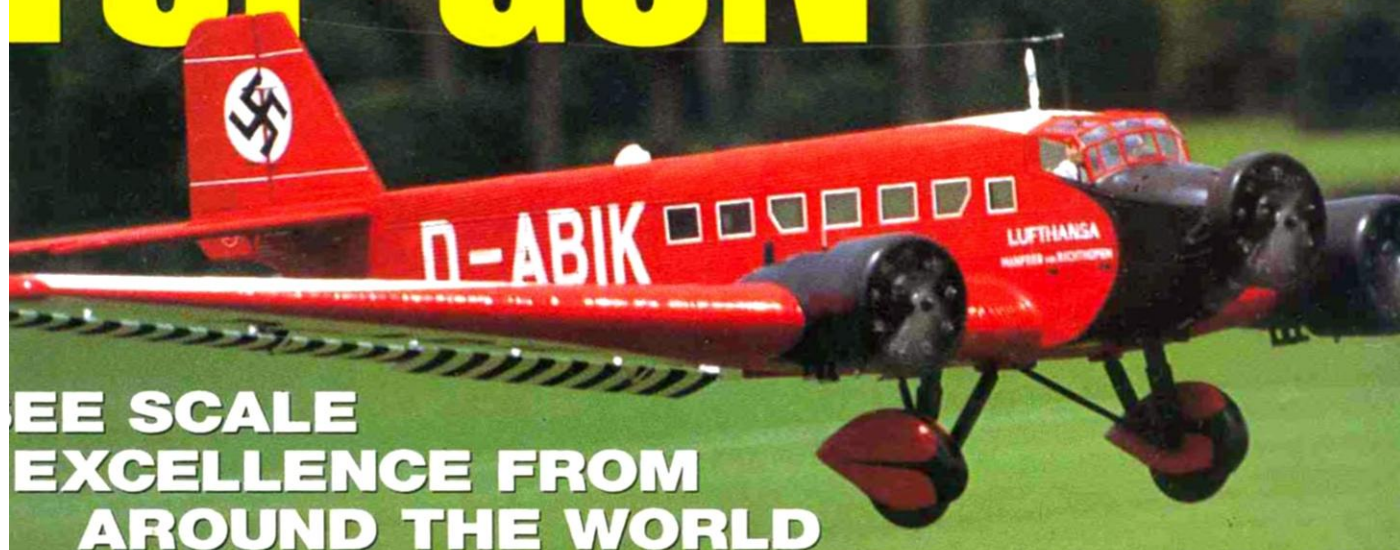
THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

NEWS

September 1997

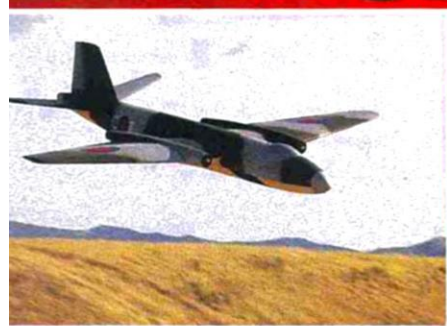
TOP GUN



**FREE SCALE
EXCELLENCE FROM
AROUND THE WORLD**



LOPE JETS **SILENT
SORTIE**



CONSTRUCTION
Hand-Launched
P-38

www.airage.com

TESTED: Hirobo SHUTTLE "Z"
Morris Hobbies BALSANOVA
House of Balsa EXTRA 300L
3W 24cc SINGLE-CYLINDER

USA \$4.95 CANADA \$5.95



F-18 JET OPTIONAL



BLACK STEEL FIGHTER COMMAND CHRONOGRAPH DESIGNED FOR MILITARY PILOTS

The best watches in the world are made in Switzerland.
The best watches in Switzerland are made in Geneva.
CHASE-DURER'S **Fighter Command** is made in Geneva.

Precision SWISS ETA 251.265 Movement / 6 Hands
4 Push-buttons / 4 Dials / 1/100th Sec Timing • Dual Time Zones
Speed Tachymetre / Digital Alarm / Hardened Mineral Crystal Lens
Twin Digital Readouts / Solid Stainless Steel Case & Band
Tritium Full Glow Hands & Indexes / W/R to 330 ft
Revolving 360° Heading Marker Bezel / 12 Hour Elapsed Time
Calendar Day & Date Windows / Individually Serial Numbered
30 Day Money Back Guarantee / 2 Year Buckle to Buckle Warranty

\$700 Value - NOW ONLY \$449 + \$6 S&H
Credit card customers may pay in three (3) interest free
monthly installments of \$150 each

Or send check or Money Order to: **CHASE-DURER**
270 No. Canon Dr, Dept 1402-319 • Beverly Hills, CA 90210
Ph 310-550-7280 / Fax 310-550-0830

CREDIT CARDS CALL: 1-800-544-4365
ASK FOR OPERATOR 319

MODEL AIRPLANE NEWS

EDITORIAL

Group Editor-in-Chief TOM ATWOOD
Editors GERRY YARRISH, LARRY MARSHALL
Senior Editor CHRIS CHIANELLI
Associate Editors DEBRA D. SHARP,
ROGER POST JR.

PUBLISHING

Group Publisher LOUIS V. DeFRANCESCO JR.
Publisher YVONNE M. DeFRANCESCO
Associate Publisher SHARON WARNER

COPY

Copy Director LYNNE SEWELL
Copyeditors JULIE GORDON, MOLLY Z. O'BYRNE
Assistant Copyeditor TOM HURLEY

ART / DESIGN

Art Director ALAN J. PALERMO
Associate Art Director BETTY K. NERO
Assistant Art Directors ANGELA A. CARPENTER,
MICHAEL BOUSE, LESLIE COSTA,
MATTHEW A. CHIAVELLI
Graphic Artist JOANNA WINN
Staff Photographer WALTER SIDAS

ADVERTISING

Director of Advertising SHARON WARNER
Assistant Manager JILL ELLEN MOLINARO
Advertising Account Executives
TOSHA CRAWFORD, KATHY FARRELL,
MONA TASSONE
Advertising Traffic Administrator
SIRI A. WHEELER
Advertising Coordinator ANN T. WIEBER

MARKETING

Director of Marketing GARY DOLZALL
Marketing Manager DANIELLE RUGGIERO

CIRCULATION

Circulation Director NED BIXLER
Circulation Coordinator NANCY BENEDICT
Circulation Assistant JENNIFER ROTUNDA

OPERATIONS

Director of Operations DAVID BOWERS
Prepress Production Supervisor
CHRISTOPHER HOFFMASTER
Production Assistant ARLENE MELKO
Magazine Production Coordinator SHEILA STARK

CORPORATE

Chairman DR. LOUIS V. DeFRANCESCO
President and CEO MICHAEL F. DOYLE
Vice President G.E. DeFRANCESCO
Secretary L.V. DeFRANCESCO
Treasurer YVONNE M. DeFRANCESCO

CONTRIBUTORS

Dave Baron, Joe Beshar, Mike Billinton, Bernard Cawley,
Mike Cherry, Roy L. Clough Jr., Hal deBolt, Don Edberg,
Bob Florence, Dave Garwood, Dave Gierke, Bill Griggs,
Henry Hatfke, Tom Hunt, Michael Lachowski, Mike Les,
Andy Lennon, George Leu, Mike McConville, Jim Newman,
Vic Olivett, Jim Onorato, Dan Parsons, Dave Patrick,
Dave Platt, Roger Post Sr., Randy Randolph, Jeff Raskin,
Guy Revel, Carl Risteen, Jim Ryan, Jim Sandquist,
Dave Shadel, Keith Shaw, Jim Simpson, Faye Stillely,
Bob Underwood, Roy Vaillancourt, George Wilson, Nick Ziroll.

INTERNET man@airage.com



Member Audit
Bureau of Circulations

PRINTED IN THE USA

MODEL AIRPLANE NEWS

Special Feature

44

From
**FLIGHT JOURNAL
IN THE COCKPIT
PROFILE:
FLYING THE
P-38 LIGHTNING**
by Jeff Ethell

Features

22

TOP GUN 1997
9th annual scale extravaganza
by Larry Marshall & Gerry Yarrish

36

SLOPE JETS
Sleek, swift and silent
by Dave Garwood

60

**MAKE FIBERGLASS
WHEEL PANTS**
In 7 easy steps
by Chris Batcheller

102

**DESERT AIRCRAFT
3W-24**
Gas engine for F3A pattern
by Mike Billinton

110

SHERLINE MILL
Precision tools for the modeler
by Jim Sandquist

Departments

8

EDITORIAL

16

AIRWAVES

18

PILOT PROJECTS

97

**PLANES WORTH
MODELING**
Nakajima Ki-84 Frank

127

PILOTS' MART

132

PRODUCT NEWS

136

**NAME
THAT PLANE**

140

CLASSIFIED ADS

142

**INDEX OF
MANUFACTURERS**

144

**INDEX OF
ADVERTISERS**



▲ Hirobo Suttle "Z"
—page 70



▶ Slope Jets
—page 36



◀ Construction—
P-38 Lightning
—page 54

ON THE COVER: main photo—Stephan Durrstein's JU-52 lands at Top Gun (photo by Gerry Yarrish); left to right: Mark Frankel's T-34 Mentor; Dave Platt's Fairey Gannet; Charlie Chamber's P-61; Dave Voglund's P-51 (photos by Walter Sidas). Bottom inset: Canberra slope jet at Los Banos (photo by Dave Garwood).

Construction

54

P-38 LIGHTNING
A 1/12-scale twin-tail
devil for combat!
by Bill Scott

Reviews

40

**MORRIS HOBBIES
BALSANOVA .40**
Knife-edge delight!
by Joe Geiger

64

**HOUSE OF BALSA
EXTRA 300L**
An Extra with a twist
by Mike DeHoyos

70

**HIROBO
SHUTTLE "Z"**
See what all the fun is about!
by Phyllis Bell

Columns

11

AIR SCOOP
"I spy for those who fly"
by Chris Chianelli

32

HINTS & KINKS
Illustrated tips from our readers
by Jim Newman

76

**SCRATCH-BUILDERS'
CORNER**
A perfect balance
by George Wilson Jr.

98

GOLDEN AGE OF R/C
Your old-time R/C place!
by Hal deBolt

106

SCALE TECHNIQUES
Tips to beat the competition
by Bob Underwood

146

FINAL APPROACH
Micro-Aerial Vehicle
Competition
by George Hicks & Gregory Bartz

EDITORIAL

by LARRY MARSHALL

TOP GUN '97

Flying a good pattern plane is pure delight; the feeling of having a plane do exactly what you ask of it is so satisfying. Spiraling up a thermal with a well-trimmed sailplane is also an exciting experience, and no matter how many times you do it, there's a thrill in harnessing nature's power. And the adrenaline rush of flying something really fast can be addictive. But it's scale airplanes that turn more heads than any other type of model. This has been true for at least as long as I've been building and flying models and probably longer.

The popularity of scale models may have something to do with their identifiability. They are models of real airplanes that did things; they have the history of their full-scale counterparts associated with them. They also have "details" such as rivets, panel lines,

else stops. The other modelers gather around as it's prepped for flight. They offer compliments and encouragement as the plane is centered on the runway. Then a hush comes over all as the plane does its work and flies.

Yes; there's something very special about scale airplanes.

Scale models don't get any better than those that show up at Top Gun

compete for accolades, trophies and cash awards. But it is also a great party, where the best in scale get to stand in the sun and enjoy good conversation and one another's models.

In this issue, we bring you *nine* full pages of Top Gun coverage so that you, too, can enjoy the thrill of these magnificent models. Unfortunately, we can't bring you the great food and hospitality. Nor can we bring you the jokes and laughter on the flightline, but I think you'll agree that the models, and the men behind them, are worth your attention.

FLIGHT JOURNAL and P-38s

We at *Model Airplane News* are quite proud of our sister publication, *Flight Journal*. We thought you'd like to get a taste of what it has to offer modelers, so we're presenting, in association with Bill Scott's P-

38 construction article, a *Flight Journal* feature article by Jeff Ethell on the P-38. If Jeff's account of flying the Lightning doesn't get you excited enough about the plane to build one, nothing will. We and the editors of *Flight Journal* hope you enjoy it.



Bud Roane's Sopwith triplane flies over the West Palm Beach Polo Grounds at Top Gun '97.

every year. A Top Gun model isn't just "detailed"; it's a miniature copy of the real thing. Participants come by invitation from around the world, to fly in the company of fellow enthusiasts. They call it a "competition" because the pilots do



Jean Chevalier's Mystery Ship touches down.

antennae, guns, cockpits and engine details that grab our attention and won't let go. Even their paint and markings identify each one as an individual, and the amount of weathering, if any, can even fix the aircraft at a particular time in its life.

All this "stuff" causes us to admire, gawk and, dare I say ... drool over a nicely built scale airplane. It hardly matters whether the plane is a sport-scale plane or one with every bit of detailing; scale planes steal the show. When someone brings a scale plane to the club field for the first time, everything



Dino DiGeorgio's Spitfire.



by CHRIS CHIANELLI

AirSCOOP

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!



ElectraGlide II

This 73-inch-wingspan electric-launched sailplane is a high-performance design that requires only a 3-channel radio. And yet it is reported that it still can be flown by beginners. The Eppler 205 airfoil and 500 square inches of wing area provide a wide speed range and mild stall characteristics. Although Aveox, the distributor, recommends a direct-drive 1406/3Y motor with an 8x5 prop on 7 cells, the model easily accepts geared units and large props. Inexpensive can motors and 8x5 props on 7 cells have even proven successful. The kit has all machine-cut parts, rolled plans and simple, but detailed, instructions. For more information, contact Aveox Inc., 31324 Via Colinas #103, Westlake Village, CA 91362; (818) 597-8915; fax (818) 597-0617.

This 1.96ci, 7-cylinder

Berger 2-stroke Radial

radial does not use a gear-drive system like 2-stroke radials have in the past. In true radial style, it has a master-rod crankshaft system to which the remaining six conrods are connected. Berger claims 8,000rpm on an 18x8 prop with an idle as low as 1,000rpm, plus good throttle transition. Part of the engine's secret is an internal supercharger that not only accounts for the performance, but also makes the Berger radial easy to start with a standard 12V starter with no choking necessary.

I'm also told the design does not

have the bottom cylinder "loading-up" problems often associated with radials. The engine weighs 58 ounces and measures only 6.25 inches in diameter, and it will fit into a Goldberg Sukhoi. Now that sounds like an awesome combination. I would love to test one of these things to see for myself. For more information, contact Berger Engines, Division of Machine Specialties, 17459 Lilac St., Unit G, Hesperia, CA 92345; (619) 949-7969.



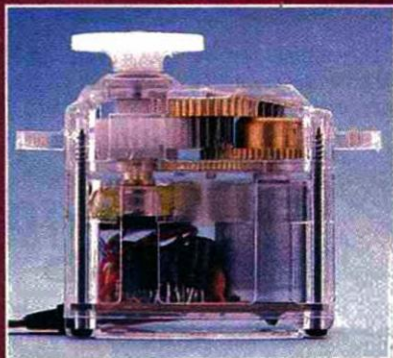
F-102 Delta

Convair's F-102, the first production delta-wing fighter, is now available as a .91-size ducted-fan model from JD Model Products. This model will accept a tractor-type fan unit or a Byron pusher unit. Considering its 90.5-inch length and over 1,400-square inches of wing area, the 102 should be adaptable to turbine power. The fuselage is fiberglass/epoxy resin and the wings are factory-glassed foam. JD states that the fuselage and scale cockpit are very well-detailed. For more information, contact JD Model Products, P.O. Box 386, Pacifica, CA 94044; (415) 359-0406; fax (415) 359-5833.



Dagger

I thought you mini-model lovers would definitely be interested in this one. According to Global Hobbies, this is the world's smallest servo. The new Cirrus CS-20 ball-bearing sub-microservo is touted as the smallest, lightest,

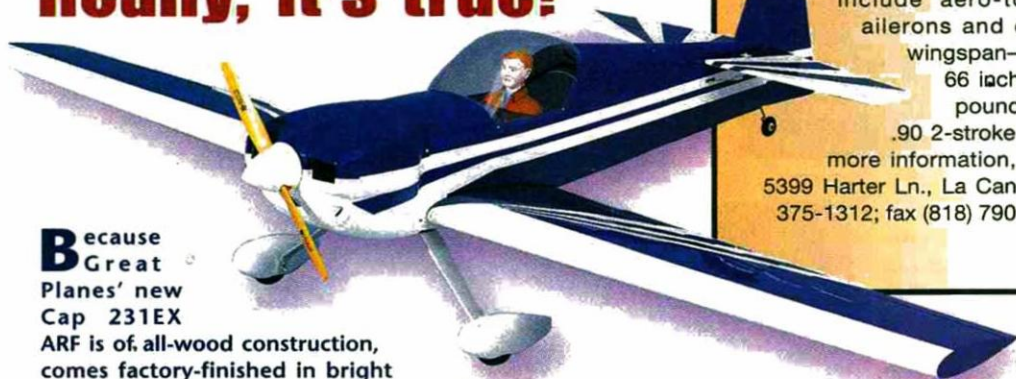


most compact production microservo available. Imagine the possibilities. Specs: size—0.86x0.43x0.83 inch; weight—0.32 ounce; speed at 4.8 volts—0.11 second/60 degrees; torque at 4.8 volts—11.11 oz.-in. Available with Futaba, Airtronics, or JR/Hitec connectors. Also new from Cirrus is the clear case, high-torque (129.86 ounces at 6 volts) CS-80 metal gear, which is excellent for helicopter use. Rumor has it, both servos are very inexpensive. For more information, contact Global Hobbies, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452.



Miniaturization Marches On

I built it myself. Really, it's true!



Because Great Planes' new Cap 231EX

ARF is of all-wood construction, comes factory-finished in bright

Top Flite MonoKote colors and uses a

minimum of plastic parts, it looks like a model you built yourself! Come repair time—and sooner or later that time comes for us all, my friends, no matter how good a pilot you are—it will be no different from repairing a model you actually did build yourself. Buy it on Thursday and do some radical maneuvers on Saturday with this fully aerobatic sport-scale airshow favorite. Comes with full complement of Great Planes hardware. Specs: wingspan—64 inches; wing area—612 square inches; weight—6.5 to 7 pounds; wing loading—24.5 to 26.4 ounces/square foot; power requirements—.40 to .51 2-stroke or .70 to .91 4-stroke. For more information, contact Great Planes Model Distributors, 2904 Research Rd., P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

An R/C Workhorse

The Multiplex BIG LIFT has seen service in many European flying clubs since the mid-'70s and has made an important contribution to the development of R/C glider aero-towing over there. It also made an excellent trainer and proved an ideal platform for special tasks such as releasing parachutes and dropping candy for the kids. I believe "toffee-bombing" is the correct European term for this activity. Obviously, carrying still and video cameras for that bird's-eye view and just about anything else creative RC'ers can come up with for fun is within the capabilities of this big bird. Although this model was discontinued some years ago, persistent demand for the kit has resulted in its re-introduction, with some improvements. This all-wooden built-up kit now includes a fuelproof cowl and Duraluminum undercarriage and wing struts. The kit also features all balsa and plywood parts (some die-cut and machined),

a complete accessory package, an instruction booklet and plans. Options include aero-tow release, flaps, ailerons and cargo door. Specs:

wingspan—91 inches; length—66 inches; weight—10 to 11 pounds; engine required—

.90 2-stroke or 1.20 4-stroke. For

more information, contact Critter Bits,

5399 Harter Ln., La Canada, CA 91011; (800)

375-1312; fax (818) 790-1346.

Silent Escort



Using CAD software and state-of-the-art laser-cutting, Flight Town USA has designed and produced this 54.5-inch-wingspan, all-wood P-51 Mustang specifically for electric power. Designed around a direct-drive AstroFlight Cobalt 40 or geared AstroFlight 25, the Mustang will also perform well on equivalent motors of other manufacturers. Requiring any standard 4-channel radio and three standard servos, the Mustang can make your entry into the world of electric power an inexpensive undertaking. The kit features CAD-drawn plans (two sheets), and it can be flown on either 16 or 18 1700SCRC cells depending on the motor used. Retail price is \$125; \$95 (plus \$5 S&H) for direct orders. Available directly from Flight Town USA, P.O. Box 20251, Springfield, IL 62708; email rchwms@aol.com.

TG-3

The TG-3 Trainer from Dave's Aircraft Works utilizes the latest EPP

(expanded polypropylene) resilient foam technology. This nearly indestructible, easy-to-build airframe is perfect for the beginning sailplane flyer. Its crash survivability is truly "magnitudes" better than that of a conventional wooden airframe. Although gliders constructed of EPP are nothing new, this one does have a unique scale-like appeal.



Standard-size radio equipment is all the TG-3 requires, and this keeps costs down for gliding neophytes. D.A.W. claims crisp performance and high-lift thermalling capabilities, so experienced pilots will enjoy the TG-3, too. Specs: wingspan—71 inches; wing area—609 square inches; length—41 inches; flying weight—35 to 41 ounces; control—rudder/elevator or rudder/elevator/aileron. For more information, contact Dave's Aircraft Works, 34455 Camino El Molino, Capistrano Beach, CA 92624; (714) 248-2773.

Foamie Trainer

Scale Interiors

Here's a 1/4-scale J-3 Cub interior for Sig, Balsa USA and Trillium kits and an interior for a Meister 1/4-scale Me 109.

According to the manufacturer, both are vacuum-formed from 0.030 high-impact styrene and are easy to assemble, detail and install. Kits include such details as instrument panels, floors, side panels, seats, sticks, rudder pedals, map holder, decal sheets and more. For more information, contact Bill Stevick at Bob Dively Models, 38131 Airport Pky., #206, Willoughby, OH 44094; (216) 953-9254; fax (216) 953-9311.



AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606; e-mail: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we can not respond to every one.

WHAT SIZE SERVO?

I would like to know what size servo to use when you change from a single aileron servo to two servos. I am under the impression that you could go to a smaller, lighter, lower-torque servo as it would only be controlling one aileron. Can you use smaller servos for the throttle control? Realistically, there is little torque required to open and close the throttle.

Keep up the good work; I really enjoy your magazine. I find the scratch-building and scale articles very good info for all types of building.

JOE BOLDEN
via email

Joe, yes, you can go to a smaller, lighter servo if you like, but I simply use the same 45-ounce servo as I would for a single servo aileron setup (JR NES 531, 507 or 517 or similar). Having a total of 90 ounces of torque for aileron may seem like overkill, but what the heck, I have never had flutter with two aileron servos. I also think that lighter, smaller servos might be more expensive (buying two smaller ones instead of buying a single extra 45-ounce servo).

Yes, I do on occasion use a smaller miniservo for throttle, especially when the fuel tank gets in the way for a straight shot to the throttle arm. In giant-scale, gas-powered models, I have installed the servo right next to the fuel tank, so I had a short linkage distance. I also know of someone who mounted the servo right on the back of the firewall (engine soft-mounted). He makes the firewall removable so the engine, firewall, fuel tank and throttle servo come out as a single unit. This was on a Ziroli AT-6 Texan, and it worked really well. Six 10-32 bolts held the firewall in place. GY

KEEP YOUR ENGINE HAPPY

Hi. I have a question: would one of the oil-additive engine treatments (like Slick 50 or Duralub) be any good to use in a 2-stroke model engine (assuming the engine is broken in)? Since this stuff sticks to all of the engine parts and protects them, it sounds like a good idea. I was thinking of running it in an older engine for just a few tankfuls to see how it burns. Have you heard of anyone try-

ing it, or have you any thoughts on this?

I really appreciate *Model Airplane News*; keep up the good work.

GARY KRAWEC
St. Catharines, Ontario, Canada

Running an automotive oil additive in a model airplane engine is a big no-no, Gary. Why? Slick 50, Duralub, etc., are meant to be used in the crankcase of a car engine, where they won't combust. In a model engine, everything eventually passes through the combustion chamber and burns up.

To prevent corrosion and keep your model engine in tip-top shape, when you've finished flying for the day, run all the fuel out of your engine and then add an after-run oil (available at hobby shops) to the carburetor. Your engine will thank you. DS

ADDRESS, PLEASE

Thanks for the great coverage of the Florida Jets meet (August '97 issue)! On page 24, you have a photo of an Air Magic T-38 Talon. You also mention this gelcoated, epoxy/glass kit in the text. I'd like to get some more info on that jet; I've searched through the issue and can't find an address for Air Magic. I hope you can help.

DOUG JOHNSON
via the Internet



Glad you liked the article, Doug. Jet modeling has really taken off (pun intended!). You can reach Air Magic Mfg. at 3200 Dutton Ave., Ste. 116, Santa Rosa, CA 95407; (707) 542-5721; fax (707) 586-0412. GY

THE BIG PICTURE

Your introduction to "Jets Over Argentina" (July '97 issue) stresses that modelers are alike all over the world, but that is not what you describe. How many *Model Airplane News* subscribers have a staff of six and a resort town named after them? How many can get an air-force flyby and an appearance by the country's president at their fly-in? How many have a dad who can afford

lavish hospitality? (What does Señor Campana do, anyway?) Anyone like that in your club? None in mine.

CLARK BOWLEN
East Windsor, CT

Clark, I can't believe you missed such a basic point. It's about a love for R/C modeling. All else is irrelevant. Statesman or chimney sweep, it does not matter. Modelers one and all love a good landing and a glow engine that's idling perfectly. Modelers around the world laugh at their buddies' silly crashes, yet want to be first in line to lend the nervous beginner that prop or glow plug he left at home. Rich or poor, these things are universal. Sorry, it's my look at the "big picture" and how we're alike, instead of focusing on how we're different. CC

ENGINE IDLE

Either last summer or the summer before, you had an article on getting a reliable engine idle. I loaned it out to a friend and never got it back. Could you let me know if I can purchase a back issue or get a reprint, as I really enjoyed the article. I have almost all the Air Age books and maybe you know of one that might have it in it. I would be glad to buy that one also. I really enjoy *Model Airplane News* and have subscribed for several years. I have flown R/C for 14 years and really find your magazine helpful; there are a lot of good articles. If you can help me, I would really appreciate it.

PHIL BUCHHOLZ
Napoleon, OH

Unfortunately, we do not have any back issues available with articles on the subject, but I have an answer. Our engine columnist David Gierke wrote a book called "2-Stroke Glow Engines for R/C Aircraft." In chapter 18, he talks about setting engine idle in great detail. The whole book is a wealth of engine info and is worth having in your library. I hope this doesn't sound as much a sales pitch as an answer to your inquiry, but it is the best we have to offer for engine information. You can call Air Age Mail Order Service at (800) 537-5874 to place an order. I hope this helps. GY

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of 1997. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.



PAIR OF MiGs

These MiG-21s were built by Bob Everitt of Bristol, England, and finished by Mike Jepson (shown). Each model is powered by a .46 engine and weighs 5½ pounds. Bob says, "They have a sprightly performance, including a phenomenal roll rate, as Mike found out on the maiden flight when he applied aileron for a gentle turn and executed three twinkie rolls!"

27% EXTRA 260

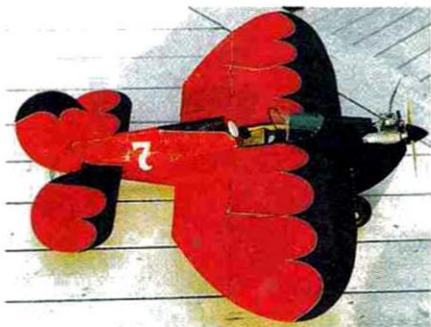
Thirteen-year-old Tim Cipolla of Stow, OH, scratch-built this 80-inch-span model from Miles Reed plans with the help of his dad, Don. The plane is powered by a Moki

1.8 engine with a TME smoke system, and it's covered with Ultracote. Tim has been flying for 5 years, and this is his first giant-scale model.



FATHER-AND-SON TEAM

Glenn Reilly and his son, Neil, of Austin, TX, built this Ohio R/C 28% Extra 300S in just four weeks. The model is covered with MonoKote and is powered by a Zenoah G-62 swinging a Zinger 22x10 prop. The 84-inch-span Extra has a smoke system installed and weighs in at 18 pounds.



BUZZIN' AROUND

Robin Wells of Jackson, MI, sent this photo of his Clancy Aviation Speedy Bee. Robin modified the kit with an R/C car shock suspension and uses a Magnum XL15 for power. He also bolted on the wing.

CHARGED-UP ULTIMATE

After flying this Goldberg Ultimate on glow power for four years, Dick Oglesbee of Mountain View, CA, decided to convert it to electric power. Now the model uses a Model Electronics Turbo 10/20 brushless motor with a 4.3:1 gearbox, Master Aircscrew 13x8 propeller and 16,1700mAh cells. Dick says that at 9 pounds, the model weighs only 4 ounces more than it did with a .70 engine. We'll bet it's a lot quieter now, too!





JASTA 18 RAVEN

This 1/4-scale Fokker D-VII is the self-designed and scratch-built handiwork of Gary Allen of Rochester, NY. The 21 1/2-pound model is covered with Solartex and painted with Hobbypro paints; it sports 7 1/2-inch-diameter wheels made out of plywood and heater hose. Gary says his Fokker is an excellent flyer and is capable of very slow flight and spirited aerobatics.

1925 HOMEBUILT

In the September '95 "Pilot Projects," we showed the bare bones of this Lincoln Sport model built by Ralph Beck of Beloit, WI. Ralph tells us that it took so long to finish the model because he was waiting for the beautiful 3-cylinder engine built by Cliff Bumpus of Mansfield, OH. The model is a near copy of the serial no. 1 Lincoln Sport owned by Denny Trone and hangared at the Brodhead, WI, airport.



BIRD DOG

Keith Sparks of Ft. Worth, TX, scratch-built this 88-inch-span L-19 from Vailly Aviation plans. The model features mechanical flaps, working navigation and landing lights and can drop bombs and supplies. The corrugated tail surfaces are vacuum-formed of .020 styrene, and the entire model is glassed and dressed up with Perfect Paint. An O.S. 1.60 4-stroke keeps this model in the air.

YOU NAME IT

Bob Richards of Escanaba, MI, designed and built this 80-inch-span model he calls "You Name It." A .90 4-stroke powers the model, and Bob says, "It will do most all aerobatics, has extreme slow-flying ability and no bad stalling characteristics." He also tells us that You Name It is becoming very popular in his area of the country, with more than 50 of the aircraft built already.



SUPER CORSAIR

Bruce Berdan of Vero Beach, FL, spent about a year building this Top Flite Super Corsair. It features Century Jet Models 90-degree rotating retracts, a Royal Aircraft aluminum cowl and a Tru-Turn spinner, and it's powered by an O.S. 1.08 engine swinging a 16x8 APC propeller. Bruce says, "Flight characteristics are fantastic ... the plane is a pleasure to fly and is extremely fast and maneuverable."



SHORT 360

Rick McCoy of Goose Bay, Newfoundland, Canada, emailed this photo of his 1/8-"stand-way-off-scale" Short 360—his first scratch-designed and -built model and his first twin. Rick is an aircraft maintenance engineer with Air Labrador, which operates these commuter aircraft, and he used 3-views from Short's maintenance manual to draw the plans. The 19-pound model has a 10-foot wingspan and is 8 feet long, and Rick says that it's a very stable and responsive flyer—even on one engine.



9th Annual Scale Extravaganza

by LARRY MARSHALL & GERRY YARRISH

PHOTOS BY WALTER SIDAS, GERRY YARRISH & LARRY MARSHALL

TOP GUN! For most of humanity, Top Gun is a place called Miramar, where Tom Cruise and Val Kilmer portrayed brash, young



Mr. "Top Gun," Frank Tiano, and his Top Dog Jake take a moment to smile for our camera.

**Model Airplane News
and Pacer Technology**

PRESENT

TOP GUN 1997

Navy fighter pilots learning to be good air-to-air combat pilots and possibly gain a bit of humility in the process.

To most modelers, however, Top Gun is an event held in Florida where some of the best scale competitors in the world meet to have fun, compete and work on their tans. There is air-to-air competition at this Top Gun, but it is we spectators who gain the humility as the craftsmanship and piloting on display are truly incredible.

In its ninth year, Top Gun has truly matured into the premier scale event on the continent. Organized by Frank Tiano, the meet operates like clockwork. In the early years, Top Gun moved to a new site each year, but Frank has settled on the West Palm Beach Polo Grounds as the permanent site for the event.

He claims this is because of the beautiful grass flying area, because of the superb spectator areas and restrooms, and because of the ample area for vendors. While these truly are benefits of flying from this field, I think the real reason he uses this field is to give the guys' left thumbs a workout during takeoffs and landings, as challenging crosswinds seem ever-present. He's not without compassion, however, as there is a huge scoreboard at the end of the runway. It's there, I'm sure, to remind the pilots' callers to say "Maneuver complete" as their pilots successfully avoid center-punching it on their takeoff.



You can always use a helping hand in the pits. Here, Rich Feroldi's Albatros is well-secured during maintenance.

Stephan Durrstein brought his Junkers Ju-52 all the way from Germany for this year's Top Gun. Stephan earned an impressive 97.583 in static with his trimotor.





An unusual entry, this Dornier Do-23G was built by Albert Kretz from modified Model Airplane News plans. Albert earned a 22nd place in Expert on this his first time at Top Gun; 94.667 static score.



Ron Buran and Paul Donofrio placed 5th in Team Scale with this beautiful YKS-7 Waco biplane.



A close-up of Dave Voglund's P-51D Mustang; 24th in Expert.

TOP GUN's Number Ones!

At this year's Top Gun, Frank Tiano added a third category—Designer Scale—to the competition. And as in Expert and Team Scale, the competition for Designer Scale's number-one slot was very close. Here's the roundup of the first-place winners for 1997.

First Place Expert

Charlie Chambers

Model: P-61 Black Widow

Plans/Kit: Don Smith Plans

Scale: 1/8

Span: 100 inches

Weight: 38 pounds

Radio: JR

Engine: Twin Webra 1.20s

Prop: Zinger 15x8



First-place winner in Expert: Charlie Chambers with his beautiful P-61 Black Widow. Charlie also won the coveted Top Guns award!

Top Gun actually starts on Thursday, as static judging takes place on Thursday and Friday, before the flight competition. Thus, these two days are designated "open flying" so guys can practice and just have fun. The Top Gun flyers put the time to good use. Nick Zirola chased Nick Jr.'s P-40 around the sky with his Skyraider. Bubba Spivey flew his Lanier Stinger and Greg Hahn flew his "beater airplanes" (his words, not ours). He did gorgeous, scale-like

rolls with his immaculate Beech D-18 and put his P-40 through its paces. I suggested to him that if those were his beater planes (with rivet details, panel lines, and weathering), Gerry and I needed to give up modeling and take up pinochle. Though they were just warming up, all the flyers put on quite a show for the spectators.

Flight judging started on Saturday morning. As with most events, early scores told little about who would stand in the win-

Close-up detail of the scale engine on Rich Feroldi's Albatros. Rich placed 10th in Designer Scale with his 1/3-scale 119-inch-span WW I fighter.



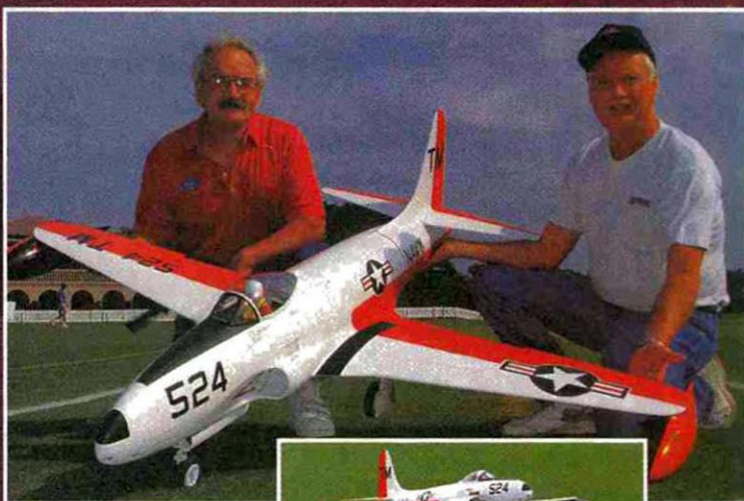
Mike Barbee adjusts the engines on his B-29 Superfortress. Built from Don Smith plans, the 1/12-scale bomber has a 141-inch span. Mike placed 29th in Expert.

ners' circle, as of the four rounds of flying, all the pilots could drop their lowest round ... or so they thought. Typically, by the end of Saturday two rounds would have been flown and some idea of who was in the lead would have developed. Not so this year however. At midday, the sky opened and the rains fell ... and fell ... and fell. The second round was canceled.



First Place Team Scale

Builder:	Jerry Caudle
Pilot:	Bob Violet
Model:	Lockheed TV-1
Plans/Kit:	BVM kit
Scale:	1/6
Span:	72 inches
Weight:	20 pounds
Radio:	JR
Engine:	JPX Turbine
Prop:	NA



Jerry Caudle (left) and Bob Violet, winners in Team Scale, pose with their Lockheed TV-1.



This Beechcraft T-42A designed and built by Ramon Torres won first place in Designer Scale.

First Place Designer Scale Ramon Torres

Model:	Beechcraft T-42A
Scale:	1/5
Span:	91 inches
Weight:	19 pounds
Radio:	Futaba
Engine:	Twin Enya .53s
Prop:	Zinger 12x6

All contestants in Designer Scale must design and scratch-build their own models.



The team entry of Frank Tiano and Bill Steffes, this Yellow Aircraft P-38 Lightning placed 4th. Power comes from two Moki 1.20s.

As luck would have it (rumor has it Frank called in a favor or two), Sunday gave us clear skies and low winds. With the field steeped in excitement, round 3 (or would that be round 2?) began. Throughout the day the pilots pressed onward, completing two more rounds of flying.

Per the Top Gun rulebook, pilots were allowed to drop their

P-61 Black Widow built from Don Smith plans. In Team Scale, Bob Violet and Jerry Caudle flying a BVM TV-1 beat out Dave Patrick and Graeme Mears who were flying their award-winning Tiger

An impressive shot of Tom Czick's P-47 Thunderbolt. Placing 12th in Designer Scale, Tom's 1/6-scale, 80-inch-span Thunderbolt is powered by a Byron Mustang 50 gas engine.

low score and average their two highest flight scores. These were added to static scores to determine the winners. Well, at least that's how it worked for most of the competitors.

In Expert class, Charlie Chambers took first place by a 3 1/3-point margin with his

Moth. The margin in this case, however, was less than a 1/3 of a point.

But wait a minute ... in Designer class (aircraft built from the builder's design/plans), Ramon Torres, flying a Beech T-42A, and Nick Zirol Jr. with his Avenger were tied with 189.958 points each. Both aircraft were incredibly well-crafted, and flight performance by both pilots was superb. Ramon, I'm sure, was hoping they'd break the tie by counting

(Continued on page 30)



TOP GUN



Beautiful flight shot of Charles Chambers' P-61 as it enters a slow roll.



The winner of Top Gun for the previous three years, Terry Nitsch competed this year with his Lockheed F-80C Shooting Star. Terry placed 4th in Expert with his JPX turbine-powered BVM jet.



Eighth-place winner in Expert, Garland Hamilton flew his impressive Lockheed DT-33B drone director. The BVM jet is powered by a JPX turbine.



Nick Zirolli Jr.'s mighty TBM Avenger begins its takeoff roll. Nick placed a close 2nd in Designer Scale with his Grumman torpedo/bomber and also won the Best Military and the Engineering Excellence awards.



Fifth-place winner in Expert, Kent Nagy also won the Best Jet Aircraft Award with his BVM F-4 Phantom; BVM .91 powered.



Placing 13th in Designer Scale, Dave Platt (left) competed once again with his impressive Fairey AS-1 Gannet. Dave's 1/8-scale, 84-inch-span model is powered by an O.S. 1.08 2-stroke engine.



Hal Parenti placed 8th in Designer Scale with his 1/8-scale, 84-inch-span Mitchell B-25J bomber. Hal's bomber is the prototype for the Wing Mfg. B-25 kit.



Tenth-place winners in Team Scale George Maiorana (left) and Skip Mast assemble their beautiful B-29 Superfortress. The 1/15-scale bomber has a wingspan of 115 inches and is powered by four O.S. .40 4-stroke engines. The B-29 is an original design.



Fourth-place winner in Designer Scale, Pat McCurry flew his beautifully executed Messerschmitt Me 109G6. Powered by a Zenoah G-62 and spanning 102 inches, the Me 109 also captured the Critics' Choice and Best Craftsmanship awards for Pat.



Roy Vaillancourt shows off his new Vailly Aviation FW-190. Roy placed 15th in Designer Scale; Q-65 for power.



Above: Randy Hansen captured 2nd place in Expert on his first time at Top Gun with his mind-boggling Cessna A-188 Agwagon. The 1/4-scale model spans 133 inches and is powered by a G-62.



Third-place winner in Expert, Jeff Foley is shown here with his happy family and his JMP T-33A Thunderbird.

Below: 19th in Expert, Mike Brewer flew this unusual 1/4-scale Aeronca LC. In its first appearance at Top Gun, the lightly loaded LC was a challenge to pilot in the strong crosswinds.



Jim Wilkinson, 14th place Expert, built and flew this beautiful FW-190A-8 from the Don Smith plans.

Expert and Designer Winners

Class Place	Modeler	Aircraft	Static Score	Final Score
Expert				
1.	Charlie Chambers	P-61B Black Widow	97.750	190.250
2.	Randy Hansen	Cessna A-188 Agwagon	96.667	186.917
3.	Jeff Foley	T-33A Thunderbird	96.917	186.730
4.	Terry Nitsch	F-80 Shooting Star	95.333	186.458
5.	Kent Nagy	F-4 Phantom	94.417	186.355
6.	Greg Hahn	B-25J Mitchell	94.667	185.792
7.	Jack Diaz	F-4E Phantom	93.833	183.146
8.	Garland Hamilton	DT-33B Thunderbird	95.583	183.021
9.	Brian O'Meara	Hawker Sea Fury	94.333	182.833
10.	Kim Foster	Sopwith Pup	97.833	182.771
11.	Cliff Tacie	Bowers Fly Baby	96.833	182.333
12.	Clark Hopkins	CT-133 Thunderbird	94.167	182.042
13.	Wayne Knight	Douglas DC-3	90.333	181.146
14.	Jim Wilkinson	FW-190A-8	95.750	181.125
15.	Jean Chevalier	Travel Air Mystery Ship	95.500	180.375
16.	Bill Setzler	Piper J-3 Cub	95.167	179.588
17.	Jim Sandquist	P-51D Mustang	94.750	179.063
18.	Lee Rice	F4U Corsair	93.500	177.688
19.	Mike Brewer	Aeronca LC	95.156	177.292
20.	Mike Winter	Sopwith	90.500	176.750
21.	Rene Alvarez	F-80C Shooting Star	91.333	175.333
22.	Albert Kretz	Dornier Do-23G	94.667	173.917
23.	John Guenther	Spitfire Mk. IX-C	89.667	173.230
24.	Dave Voglund	P-51D Mustang	93.333	163.396
25.	Rich Uravitch	SNJ-5 Texan	93.250	154.313
26.	Stephan Durrstein	Junkers Ju-52	97.583	136.146
27.	Bill McCallie	P-51D Mustang	93.833	131.896
28.	Steve Sauger	Hawker Sea Fury	93.167	128.042
29.	Mike Barbee	B-29 Superfortress	92.750	110.813
30.	Ed Newman	KI-61 Tony	93.750	110.625
31.	David Hayes	P-51D Mustang	94.250	110.438
32.	Rick Shaeffer	P-38 Lightning	-	-

Designer Scale

1.	Ramon Torres	Beech T-42A	97.583	189.958*
2.	Nick Zioli Jr.	Grumman Avenger	98.083	189.958*
3.	Corvin Miller	Globe Swift	95.333	189.146
4.	Pat McCurry	Me 109G	96.833	186.333
5.	Charlie Nelson	VKS-7F Waco	96.917	185.730
6.	Bob Underwood	Hiperbipe	98.333	185.583
7.	Bud Roane	Sopwith Triplane	95.167	182.355
8.	Hal Parenti	B-25 Mitchell	91.750	181.875
9.	Nick Zioli Sr.	P-38 Lightning	90.917	177.292
10.	Richard Feroldi	Albatros DV	94.000	176.250
11.	Art Johnson	P-82E	91.333	176.021
12.	Tom Czick	P-47 Thunderbolt	87.583	173.833
13.	Dave Platt	Fairey AS-1 Gannet	94.167	138.667
14.	Tom Polapink	Sopwith Snipe	95.167	135.230
15.	Roy Vaillancourt	FW-190	93.250	131.313

*Tie broken by aggregate score



The people behind the scenes; the Palm Beach Aero Club members work very hard each year to pull off the event. Job well done!

Top Gun Tech Talk

Radios

Futaba	29
Airtronics	15
JR	15
Graupner	2
Ace R/C	1

Engines

O.S.	14
Zenoah	10
Moki	8
BVM	5
Quadra	3
Eagle	2
Enya	2
Laser	2
Saito	2
A&M	1
D&B	1
K&B	1
Mustang 50	1
Sachs	1
Seidel	1
SuperTigre	1
Webra	1
3W	1
YS	1

Props

Zinger	35
Bolly	2
Dynathrust	1
Graupner	3
APC	6
Menz	2
Master Airscrew	2
Forte	1

Aircraft Type

WW I	5
WW II	35
Post-WW II	13
Civilian	9

Props	52
Jets	10

Single-engine	45
Twin	14
Multi-engine	3

Mono	54
Biplanes	7
Tripe	1

Kit-built	26
Plans-built	18
Scratch-built	18

Team Scale Winners

Place	Modeler	Aircraft	Static Score	Final Score
1.	Bob Violett/Jerry Caudle	Lockheed TV-1	96.300	187.425
2.	Dave Patrick/Graeme Mears	DH-88 Tiger Moth	95.283	187.158
3.	Geoff Combs/Alvin Brown	Douglas DC-3	94.667	183.042
4.	Frank Tiano/Bill Steffes	P-38 Lightning	93.517	182.642
5.	Ron Buran/Paul Donofrio	YKS-7 Waco	92.583	179.646*
6.	Steve Elias/Ian Richardson	T-33A Thunderbird	94.833	179.646*
7.	Raymond Labonte/Peter Flanagan	Harvard Mk IV	91.267	178.642
8.	Bob Boswell/Mark Frankel	T-34 Mentor	91.750	178.250
9.	Dave Pinegar/Mariano Alfafare	Clipped Wing Cub	91.733	175.608
10.	Skip Mast/George Maiorana	B-29 Superfortess	94.327	174.952
11.	Eduardo Gutierrez/Pedro Serco	SNJ-5	88.967	170.217
12.	Dean Digiorgio/Dino Digiorgio	Supermarine Spitfire	88.917	97.667
13.	Bob Forienze/Wayne Siewert	P-51 Mustang	94.000	94.000
14.	Rei Gonzalez/Albert Araujo	A4-E Skyhawk	90.867	92.367
15.	John Kohler/Fred Stagg	AT-6 Texan	91.333	91.333
16.	Bill Fuori/John Tozser	B-25 Mitchell	—	—

*Tie broken by aggregate score

TOP GUN



Third place in Team Scale went to Geoff Combs and Alvin Brown for their nicely executed DC-3; 126-inch span; YS .91 engines.

Right: 7th place winner in Designer Scale was Bud Roane, who traded in his Pup this year for a new Sopwith triplane. Despite the usual Top Gun crosswind, Bud did a wonderful job of keeping his tripe under control.



Eduardo Gutierrez and Pedro Serco, a first-time Team Scale entry from Bolivia, prepare their SNJ-5 Texan for another round. Eduardo and Pedro placed 11th.

Special Achievement Awards

High Static Score	Modeler	Aircraft	Prize	Sponsor
Designer Scale	Bob Underwood	Hiperpipe	Airtronics radio and \$200	Hobby Nut
Expert	Kim Foster	Sopwith Pup	JR radio and \$200	Dave Platt Models
Team Scale	Jerry Caudle	TV1	\$200	Nick Zirolli Plans

Award	Modeler	Aircraft	Prize	Sponsor
Best Civilian Aircraft	Randy Hansen	Cessna Agwagon	JR radio and \$200	FTE
Best Jet Aircraft	Kent Nagy	F-4 Phantom	\$200	BVM
Best Military Aircraft	Nick Zirolli Jr.	Grumman Avenger	\$200	Don Smith Plans
Best Biplane	Graeme Mears	D.H.-88 Tiger Moth	\$200	R/C Report
Best Craftsmanship	Pat McCurry	Me 109G	Moki engine and \$200	Aero Tech
Engineering Excellence	Nick Zirolli Jr.	Grumman Avenger	\$200	Robart Mfg.
Critics Choice	Pat McCurry	Me 109G	\$200	Airtronics & Van Dell Jewelers
Critics Choice Runner-Up	Mark Frankel	T-34 Mentor	—	NA
Top Buns	Charlie Chambers			Top Gun Hussies

Flight Awards	Modeler	Aircraft	Prize	Sponsor
Best Jet Performance	Terry Nitsch	F-80 Shooting Star	\$200	Turbomin
Best 2-Stroke Performance	Graeme Mears	Tiger Moth	\$200 and Moki 1.8	Gerard Ent./Moki
	Dave Patrick			
Best 4-stroke Performance	Bob Underwood	Hiperpipe	\$200 and Saito 1.50	Horizon Hobby Dist.
Best Gas Performance	Greg Hahn	B-25 Mitchell	\$200 and Zenoah G-445	ISC Intl.
Best Multi Performance	Wayne Knight	C-47	\$200	Airtronics
Best Aerobatic Performance	Kim Foster	Sopwith Pup	\$200	Lanier RC

TOP GUN



A beautiful flight shot of René Alvarez' P-80 Shooting Star. René placed 21st in Expert with the BVM kit.

(Continued from page 25)

the engines (Ramon had two) and I'm sure that Nick Jr. was thinking they should determine the winner by measuring the size of the projectile dropped during bomb-drop maneuvers (the Avenger's torpedo is huge). But a more



30 Seconds Over Top Gun?

It could have been a scene from the movie "30 Seconds Over Toyko." Van Johnson is at the controls of his B-25 Mitchell bomber *Ruptured Duck* and flying along the coast of China desperately looking for a place to land after his mission over Toyko. "Over there, a clearing on the beach; I'm bringing her in!" Then, the sputter of the right engine as it gives up the ghost. Rain beats against the windshield ... Fade to black.

No, no, no! It's not raining (much), it's not Van Johnson and it's not the China coast. It is Greg Hahn with his B-25 at Top Gun.

During Greg's second round, Greg had just let his salvo of six miniature 500-pound bombs go when his port engine went silent. But instead of aborting the rest of his flight, Greg continued on with only the starboard Zenoah G-38 for power. Greg trimmed his bomber for the offset engine thrust, completed five additional maneuvers and landed his big 118-inch-span Mitchell without so much as a bounce. Mission accomplished. Jimmy Doolittle would have been proud!

A little-known fact about Top Gun is that it's not an R/C-only event. Model aviators have a way of having fun with anything with wings, and Top Gun participants are no exception. A free-flight scale event is held every year, sponsored by Tom Herr of Herr Engineering. Many scale builders, me included, have understood for a



Free Flight at Top Gun

long time that building simpler, free-flight scale models is a good way to build some of the many "gotta build one of these some day" projects that couldn't possibly be done in three lifetimes as R/C models. They're fun to fly, inexpensive to build, and an interesting challenge.



Flying takes place on the mornings of Friday, Saturday, and Sunday. On the first two days, qualifiers are held where finalists are selected for the Sunday-morning finale. All flights are conducted in a mass-launch fashion, with the last planes in the air advancing or, ultimately, winning the event. Any rubber-powered scale model is considered appropriate but you must be involved in Top Gun in some way, e.g., staff, pilot, caller, sponsor to enter. This year, the event was won by Skip Mast.

Next year's event should be even better. In addition to the traditional rubber-power segment, Rich Uravitch will be sponsoring a Jet Scale event, with the planes being powered by Jetex engines. It should be a great addition to the 10th anniversary Top Gun event.



Fourteenth-place winner in Expert Scale, Jim Wilkinson built and flew this FW-190A-8. Built from Don Smith plans, the 190 has a 90-inch span and is powered by an O.S. 300.

reasoned approach prevailed as the rulebook states that ties are broken by aggregate flight scores. Ramon won the day.

Top Gun is a competition. In fact, it's pretty intense competition. In spite of this, Top Gun may be one of the best places to dispel the myth that competitors don't have fun. There is a lot of laughter at Top Gun. For the most part, participants enjoy the show as much as the rest of us. On this field, "adversaries" are also good friends. And so it should be, as everyone who attends Top Gun comes away a winner.

Major Sponsors

- ✪ Model Airplane News (cash and shirts)
- ✪ Pacer Technology: The ZAP Gang (cash and hats)
- ✪ Robart Mfg. (cash)

Supporting Sponsors

- ✪ Du-Bro (hardware and accessories)
- ✪ Vailly Aviation (wheels and tires)
- ✪ JR Radio (8-channel radio)
- ✪ ZDZ Engines (40cc engine)
- ✪ Ron Norris (Moki 1.20 engine)

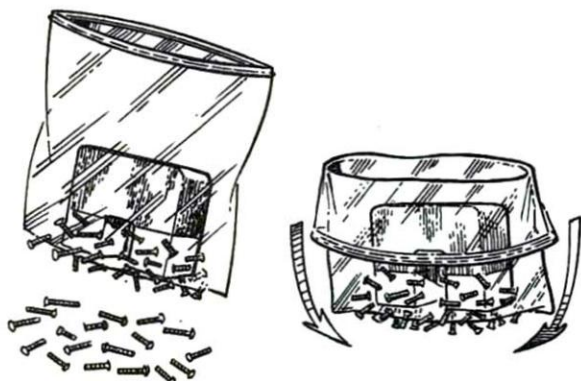
Also see Special Achievement



Hints & KINKS

by JIM NEWMAN

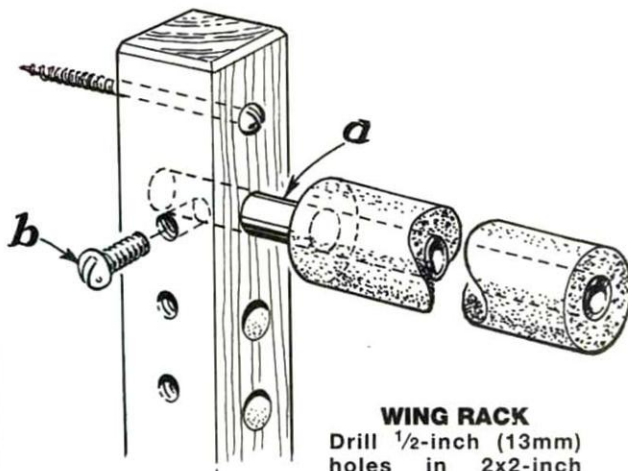
Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



QUICK PICKER-UPPER

To pick up spilled screws, first turn a zipper-type plastic bag inside out, then place a magnet inside. Allow the screws to stick to the outside of the bag, then carefully turn it right side out to trap the screws inside.

W.W. Turnbow, Weinert, TX

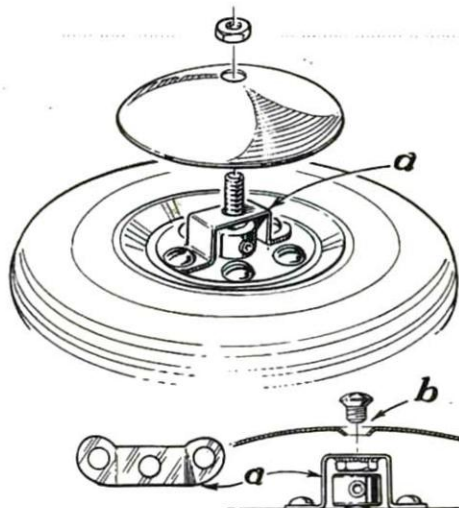


WING RACK

Drill 1/2-inch (13mm) holes in 2x2-inch (50x50mm) uprights for

1/2-inch-diameter aluminum tubes (a) that are long enough to support the wings. Retain the tubes with a screw (b) or clamp them together with a setscrew so that the spacing can be changed. Sponge rubber pipe insulation on the tubes cushions the wings.

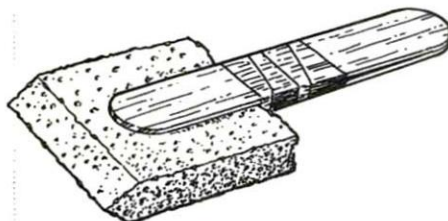
F.W. Burman, Nowra, NSW, Australia



HUBCAP RETAINER

For large Du-Bro or similar wheels. A typical soda can hubcap can be retained by a strip-metal "bridge" (a) to which is soldered a 4-40 screw with its head filed thin. Use a thin nut and Loctite to retain the cap. Another way is to solder a thin nut under the bridge and hold it with a countersunk screw (b) that's set down into a dimple.

Eduardo Keymer, Quintero, Chile



THROWAWAY BRUSHES

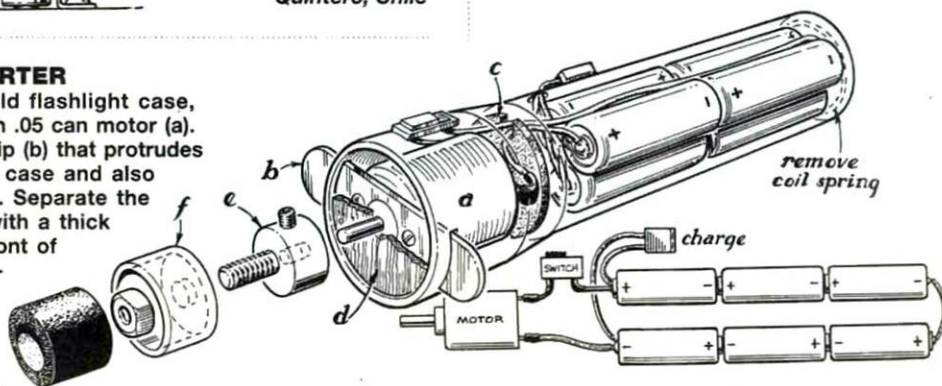
Trap a suitable size square of foam sponge between two Popsicle sticks, then secure them with a wrap of tape. Works well; costs virtually nothing!

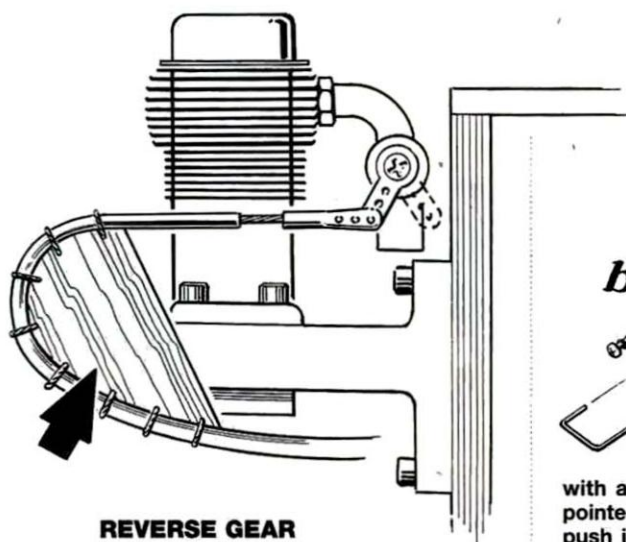
Carlos de Oliveira Leite, Brasilia, Brazil

.05 STARTER

Build a starter into an old flashlight case, with six AA Ni-Cds and an .05 can motor (a). Mount the motor on a strip (b) that protrudes through the sides of the case and also serves as a finger guard. Separate the motor from the Ni-Cds with a thick card (c), and close the front of the case by a thin, hot-glued, ply disk (d). A propeller adapter (e), a PVC pipe cap (f) and a small rubber hose to fit a Cox spinner complete the job.

Joseph Papasso, Mt. Laurel, NJ

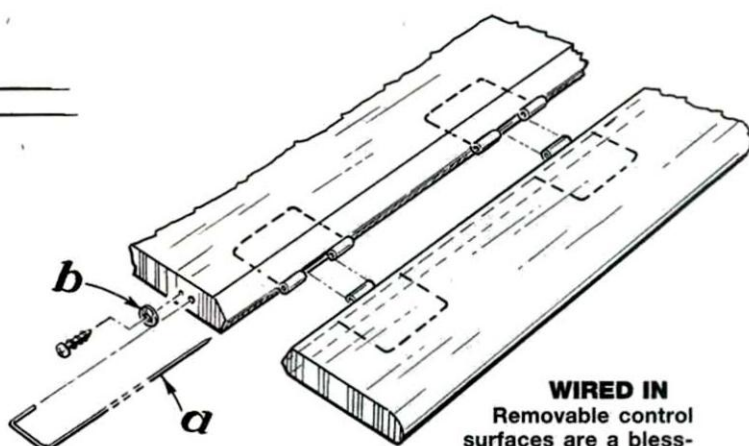




REVERSE GEAR

When that 4-stroke carburetor is too close to the firewall for the throttle clevis, you can bend that cable-in-a-tube 180 degrees by sewing and gluing it to a piece of lite-ply so it maintains the desired curve. Support the ply by gluing it onto a block on the side of the engine mount.

Dennis Harast, Willowbrook, IL



WIRED IN

Removable control surfaces are a blessing when you're faced

with a repair. Discard the individual hinge pins and use a long, pointed wire (a) of the same diameter. Bend the outboard end over, push it into the wood and secure it with a tiny blob of thick CA. Another method is to trap the wire under a washer (b). A nylon tube in the leading edge of the aileron accommodates the tang of the strip-aileron torque rod and allows the aileron to be slid off.

Ralph Weiss, Carle Place, NY

270-325

TRICK CYCLIST

On later model transmitters, you can't discharge the Ni-Cd pack through the charging socket because a diode in the circuit prevents reverse flow. If you can easily remove the pack, make up this adapter by using the Radio Shack parts shown. Now you can easily plug the pack into your charger or discharger.

Ted Krempa, Oceanside, CA

274-1573A

FILTER TIP

If your field is particularly dry and dusty, make a filter by wiring a layer of pantyhose material over the carburetor intake. This, at least, will help prevent bits of grass, small stones and the odd small animal from being sucked in.

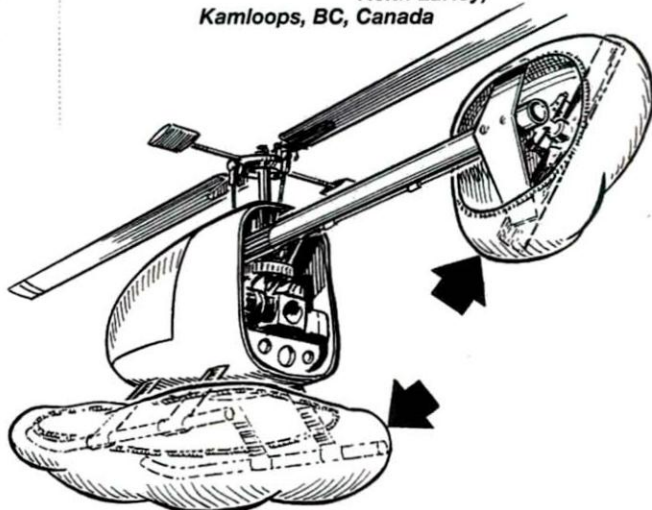
Keith LaRoy,

Kamloops, BC, Canada

HAT DANCE

If you hang up your chopper between sessions, oil may dribble down the skids and the tail rotor, and it may drip onto the floor or workbench. To catch the oil, use a couple of old shower caps, as shown (arrowed).

Fabio Nobre Gil, Piracicaba, Brazil



NOTHING
IN SOARING
looks cooler
on the wing
than a slope
jet. Just as
military jets
hold a special
fascination for
aviation buffs,
slope jets hold
a special
place in the
hearts and
minds of
R/C sailplane
pilots.

Sleek, swift and silent

SLOPE J

by DAVE GARWOOD

If you know about the fantastic engineering done at British Aerospace, the Grumman Iron Works, the Lockheed Skunk Works and the McDonnell-Douglas Phantom Works, you'll like slope jets. If you read the history of air combat over Korea, Cuba, Vietnam or the Persian Gulf and you fly gliders, you'll like slope jets. If you dig the looks of sharply swept wings and tails, you'll appreciate the lines of these planes.

When I go to the slope with five planes, none get looks and comments like my TLAR Enterprises* BAe Hawk or my Walt Bub* A-6

Intruder will. Like other areas of scale modeling, the main feature of slope jets is their appearance and the way they fire your imagination.

HOW WELL DO THEY FLY?

Models optimized for scale accuracy dictate limitations on flight performance. If their wings were bigger, these planes would fly in lighter lift, but then they wouldn't look scale. Modeling jet intakes forces impressive frontal area. Blunt trailing structures like jet exhausts are the antithesis of good glider design.

Military aircraft tend to have lumps, bumps, protrusions and other drag-producing structures, not to mention engines and weapons hanging beneath the wings of multi-engine bombers. The job of the slope jet designer is to make a plane that looks real, but flies *without* the thrust of a jet engine. It's not easy.

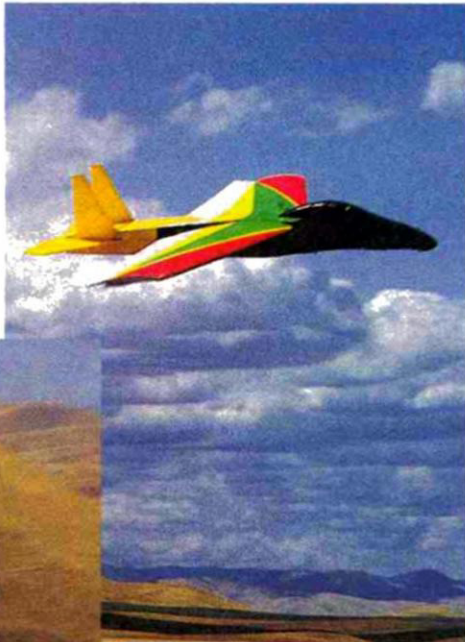
In practice, some fly better than others. Until we have slope jet kits of long-wing birds like the Lockheed U-2 spy plane or the Grumman Panther, we won't have off-the-shelf kits of aileron-trainer type jets. Most slope jets now are built from scratch or converted from power-plane kits.

The first slope jet I saw fly was Bob Power's F-4 Phantom, converted

from a Royal* balsa kit and meant to have a .60 engine in its nose. The plane looks just great but requires extreme lift and high skill to fly. Bob's Phantom won't roll with the original-size ailerons. It's also tricky to land on its low wing.

I got over my fear of big frontal area with Walt Bub's

Right: Dave Wenzlick's McDonnell-Douglas F-15 Eagle, a bounceable foam slope jet at the 1996 Los Banos Slope Scale Soar-In. Built and flown by Dave Wenzlick.



Left: Lynsell Miller's original design English Electric Canberra, in target-tug paint scheme, flying in inland slope lift at the '96 Los Banos Slope Scale Soar-In.



ETS



A-6 Intruder, which was designed for slope from the beginning. Using a slope airfoil and big ailerons on a wing slightly stretched in span, this plane flies like the Sig Ninja—a slope aileron trainer. On its maiden flight of two hours, the transmitter was passed among four pilots twice. The mid wing makes for easier landings, but it's harder to model.

The TLAR BAe Hawk was my first jet kit made for the slope, and it has design features to optimize rough slope landings on its low wing and anhedral stabs. This one matches my flying skill and slope sites so well that I actually have three of them, because slope planes eventually get beat up and I want to always have one of these beauties ready to fly. Doug's Hawk is exceptionally well-balanced in aileron and elevator control and will do everything an intermediate aerobatic slope soarer will do, though it needs good lift for sustained inverted flight.

Still, it isn't a slope trainer. For beginner slope jets, look to foamie models like the Aerofoam*

F-15 Eagle, Combat Aircraft* F-16 Fighting Falcon and Trick R/C* B-2 Stealth Bomber.

WHERE TO GET SLOPE JETS

Slope jet kits aren't as common as 2-meter trainer gliders, although they generally take the same 2-channel basic radios. You'll have to search out these planes; here are five places to start:

• Scratch-built, original design model.

Hardcore do-it-yourselfers can get the jet type they want in their desired size and weight by starting with 3-view drawings. Examples of this strategy are Lynsel Miller's English Electric Canberra, Walter Bub's A-6 Grumman Intruder, and Bill and Bunny Kuhlman's Messerschmitt Me P.1111.

• Plans-built model. If you build your planes from plans, be aware that the

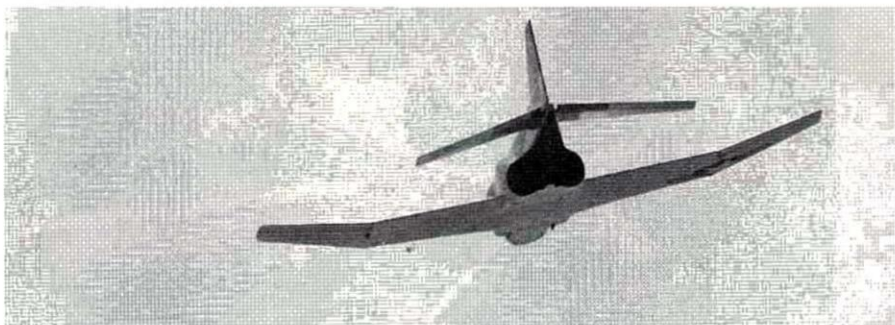
"Scale Gliders Catalog" from Bob Holman Plans* lists hundreds of sailplane plans. Slope jets in the catalog include a Boeing B-52, an Avro Vulcan, a BAe Lightning, a BAe Harrier, a Panavia Tornado, a Lockheed U-2, a McDonnell-Douglas A/F-18 Hornet and several others. Bob Holman can often supply a copy of the original construction article with the plans.



Above: Doug Buchanan's British Aerospace Hawk flying in inland slope lift at Los Banos, CA. This example was built and flown by Gary Brokaw.



Left: Bob Power's McDonnell-Douglas F-4 Phantom over the Atlantic Ocean at Cape Cod, MA.



Above and below: Bob Power's McDonnell-Douglas F-4 Phantom over the Atlantic Ocean at Cape Cod, MA. Right: Walter Bub-designed Grumman A-6 Intruder flying over the Great Salt Lake at Soar Utah '95. This example was built and flown by Bill Griggs.



I have a set of Bob Holman plans for the Sukhoi Su-25 Frogfoot, Soviet tank-killer counterpart to the A-10 Warthog. It looks like it will be a successful slope plane.

• **Conversion from power-plane kit.** For experienced slope builders, converting a fuel-power kit presents many options. Bob Power's F-4 Phantom is an example, as is Charlie Morrey's impressive F-86 Sabre converted from a Yellow Aircraft* ducted-fan kit. A flying buddy of mine is working



Lou Garwood launches his Fairchild A-10 Warthog over Cape Cod Bay, MA.

to convert the Great Planes* Patriot sort-a-scale balsa-and-plywood kit for slope.

• **Foam slope kits.** Foam planes build quickly, and the new EPP foam makes for some incredibly tough slope ships. The injection-molded Combat Models F-16 Fighting Falcon, the Trick R/C B-2 Stealth Bomber and the Aerofoam F-15 Eagle are examples. Sorry; I haven't flown these planes or seen them flown.

• **Fiberglass-fuse/foam-wing slope kits.** For scale appearance and quick construction, there are a few kits designed for slope flying that feature molded fiberglass fuselages and sheeted-foam-core wings. The TLAR BAe Hawk has already been mentioned. Another candidate in this category is the Aero Model Design A-4 Skyhawk available from Patterick's* and Northeast Sailplanes*. If you like futuristic spaceship models, check out the Dream Catcher Hobby* Stryker.

CONCLUSION

My parting advice is to strike while the iron is hot. When you find a slope jet kit



that you like, buy it. These planes are made by small companies that need your support to stay in business. Every kit counts to them. If they can't sell these spe-



Author Dave Garwood and son Lou with A-10 Warthogs on a three-generation flying trip to Cape Cod. (Photo by Dave Garwood Sr.)

cialized planes, they may not be around next year.

By the way, if you're a designer or kit maker, I think the world needs a U-2 spy plane and an Su-25 Frogfoot kit. If you can get an Su-27 or a MiG-29 Fulcrum to fly in slope lift, I'll be first in line to buy one.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.

MODEL
AIRPLANE
NEWS

FIELD & BENCH REVIEW

by JOE GEIGER

TOM STRYKER, Morris Hobbies' talented and prolific model airplane designer, has already produced such unique models as the Morris



PHOTO BY JOE GEIGER

Hobbies' Gee-Whiz-Bee, Su-Do-Khoi, Morris the Knife and Spinsation. Tom has now moved from profile fun-fly craft into the mainstream of full-bodied sport aerobatic planes with the BalsaNova .40, an exceptionally good-looking and capable aircraft.

THE KIT

The kit includes much of the necessary hardware, but rudder control hardware isn't standard equipment. I tried the Morris Hobbies Pull-Pull Lite rudder control system on mine, and it works very well, so you might want to consider this system when you order the "extras" to complete your kit.

The majority of the die-cut wood in the kit is $\frac{1}{8}$ inch thick, but none of the wood of this thickness was cut deeply enough, so I had to do some annoying work with a hobby knife that was unexpected in this age of machine- and laser-cut parts. I also had to get a substitute for one of the wing spars because it was much too soft.

A sturdy set of landing gear and plastic wheel pants is included in the kit. If you intend to use the wheel pants, be aware that they allow very little clearance for the suggested

$2\frac{3}{4}$ -inch wheels, and I could only get Dave Brown* treaded lite wheels to fit at all; other wheels were either too thick or not rounded enough. I would have preferred that the pants be slightly larger, but this might have

MORRIS HOBBIES

Balsa NOVA.40

Knife-edge delight!



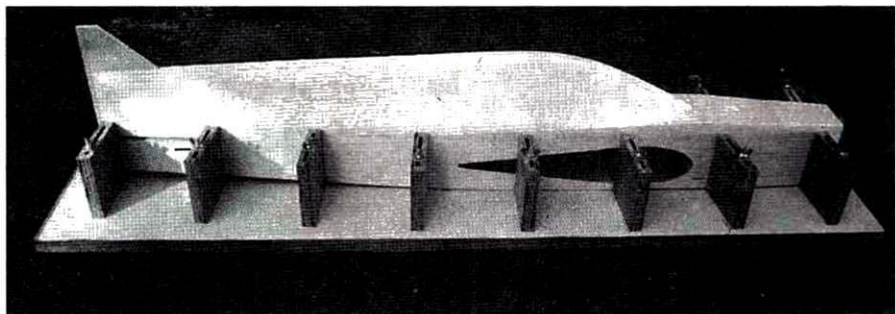
detracted somewhat from the appearance. I used a Du-Bro* tailwheel bracket, instead of mounting the tailwheel on the supplied hinge.

The 43-page, photo-illustrated instruction manual proved to be very complete, and I found that I could follow it without my usual modifications and rearrangements. In addition to the expected building instructions, there are some excellent hints on hardware selection, radio and engine installation, pipe tuning, normal flying and aerobatics.

The CAD-drawn plans, which are a single 36x66-inch rolled sheet, are a bit unwieldy; you may want to cut them into several more manageable pieces. There are no templates on the plans for the ribs and formers, so I recommend that you photocopy or trace the die-cut parts before assembly, just in case you have an unfortunate "accident" somewhere down the line.

FUSELAGE AND EMPENNAGE

The BalsaNova's fuselage is the key to its knife-edge performance and must be carefully built. The instructions emphasize the need for a jig to do this job correctly, and it's hard to imagine doing it otherwise. The formers are made of lite-ply and the sides, the turtle deck and the canopy are constructed of laminated, 1/8-inch balsa. In the initial assembly steps, you must position your engine on the firewall and construct the tank compartment and landing gear mount. Both the firewall and landing gear mount are laminated lite-ply, but because I've had some bad experiences with this material in high-stress areas, I substituted birch aircraft ply. There was only a slight weight penalty for this change, and it gave me much more peace of mind. If you use the suggested MVVS* .40, be aware that there has been a design change in the header since the plans were drawn and the instructions were printed. You'll have to position your engine slightly differently than shown if you have the two-piece header instead of the one-piece. Also, when you finish the hatch cover, I recommend that you either harden the balsa with CA around the hold-down screw holes, or drill them out for a slice of hardwood dowel so they won't get crushed with use. I used Pacer* Zap and



The tall, narrow BalsaNova fuselage must be constructed in a fuselage jig to keep it straight. The fuselage is constructed almost entirely of 1/8-inch wood that must be wetted and bent to shape.

Carl Goldberg Models* Super Jet through-out construction.

The rudder and fin are assembled by laminating together several pieces of 1/8-inch balsa to arrive at the desired shape. The stab and elevator, on the other hand, are built-up stick structures with 3/32-inch sheeting.

BUILDING THE WING

The BalsaNova wing is a typical D-tube structure, built upside-down on the plan



The installation of the Rony muffler and the wing-mounted aileron servos.

and constructed of predominantly 3/32-inch balsa. Servo boxes are built into the sheeted area near the center of each wing panel. The servo wiring is later "fished" through the center section and out into the fuselage with a piece of string and a small fishing weight. I was a bit apprehensive about this method, but it worked like a charm. Part of the fuselage is cut away and secured to the bottom of the wing as a belly pan. The wing is held to the fuselage with a single 1/4-inch nylon bolt in the rear and a single 1/4-inch dowel pin in the leading edge.

Fellow Sierra Sagebrush Flyers club member Rory Harden covered my BalsaNova with yellow Ultracote* and metallic red MonoKote*.

THE ENGINE

Tom Stryker is very enthusiastic about the MVVS .40, and Morris Hobbies has been

SPECIFICATIONS

Name: BalsaNova
Type: Sport aerobatic
Manufacturer: Morris Hobbies
Wingspan: 52 3/8 in.
Wing area: 675 sq. in.
Weight: 5 1/2 lb.
Wing loading: 18.77 oz./sq. ft.
Engine required: .40 to .50 2-stroke
Engine used: MVVS .40
Channels req'd: 4 (five servos)
Radio used: Futaba 6XA
List price: \$99.95

Features: the BalsaNova is a balsa and plywood sport model with a very complete, photo-illustrated manual and rolled, CAD-drawn plans. The kit includes aluminum landing gear, plastic wheel pants and much of the necessary hardware. Some flying instructions are included in the manual, and an additional flying video is available.

Comments: the BalsaNova is one of the best flying sport aerobatic models that I have flown. It brings some of the best features of fun-fly planes into the sport aerobatic arena in a very appealing package. It would be an excellent choice for the flyer who has completed his basic training and has experimented with some aerobatics, or the seasoned pilot looking for a plane capable of superior knife-edge performance, as well as a spectrum of aerobatics that is limited only by his imagination.

Hits

- Excellent flight performance.
- Well-written instruction manual.
- Stylish appearance.
- Sturdy landing gear.

Misses

- Die-cutting does not extend deeply enough into the 1/8-inch-thick wood.

offering this engine and the BalsaNova kit as a combo. I was pleased with the engine's appearance, but surprised to find what looked like metal shavings in the carburetor

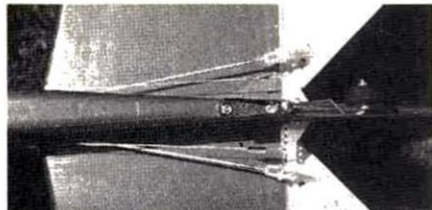
BALSANOVA .40

bore. A quick touch with a cotton swab proved that there were, indeed, about six aluminum shavings in the bore, so I removed the carb and cleaned it out. After a careful inspection revealed no more shavings, the engine went on the test stand, started up on the first flip and has never seen an electric starter since. What a sweetheart! This engine has proven to be a real powerhouse, too.

After I had broken in the MVVS on the test stand, I couldn't resist trying a few muffler configurations on it. I ended up using a very reasonably priced mousse-can muffler made by Rony Mfg.* It has a special inner



The MVVS .40 is a good match for the BalsaNova.



The Morris Hobbies Pull-Pull Lite rudder system, the double elevator pushrod and the Du-Bro tailwheel bracket.

FLIGHT PERFORMANCE

When the day finally arrived to test-fly the BalsaNova, I arranged to meet with Bob Brogan and Frank Chase at the High Sierra R/C Field in Carson City, NV, for some photos and flying. It must be taken into consideration that this field is at an elevation that is near 5,000 feet, so we didn't expect the type of performance from the engine or plane that would be realized at lower altitudes. For the test flight, we used Sig* 10% castor/synthetic fuel, a Fox* R/C long plug and an APC* 10.5x4.5 prop.

• Takeoff and landing

The first couple of takeoffs were, well, pretty squirrely. The rudder throw was set up according to the plans, and Tom had been specific in the instructions; those throws were the *maximum* suggested. Since there aren't any dual rates or exponential control setups for rudder on the 6XA, I opted to change to 70% ATV settings on the rudder, and from then on, takeoffs became a delight. The BalsaNova likes to take off by itself; just add power, watch it get light on the wheels, then give the slightest (and I do mean slight) touch of up, and away it goes. Landings were phenomenal right from the first touchdown.

For some reason, this plane loves three-point landings like dogs love trucks. I don't think we got a single-wheel landing all day. As the BalsaNova slows down, it assumes the exact position necessary for a three-point and settles right in. Amazing!

• Low-speed performance

I'll have to admit that I was a bit nervous about this, but with absolutely no reason. The BalsaNova has a wing loading that's quite low for a sport plane and a thick, fun-fly-style airfoil, so slow flight turned out to be no problem. It's not one of those feather-light fun-fly planes, but it wasn't meant to be. It slows down very nicely, stalls predictably and straight ahead, and then goes right on flying. It will putt along at low throttle with plenty of control authority, much like a trainer. (I'm not suggesting that it be used as a trainer, though.)

• High-speed performance

We're talking relativity here. The BalsaNova doesn't really go what I'd call fast. All that frontal area and thick airfoil keep the speed down under Mach 3. Actually, it probably stays down below 60mph or so, which is respectable, but not really fast. The important thing about the BalsaNova is that it doesn't require any trim change.

• Aerobatics

Now we're in the BalsaNova's realm of excellence. After a bit of flight trim, I was already succeeding with a knife-edge loop in only the second or third flight! (OK, a little sloppy, but what the heck, give a guy a little time with the thing.) Tight, successive loops are a thing of beauty. This plane could loop the whole flight and not lose its heading. Pretty soon, I switched to maximum suggested throws on elevator and ailerons and was having an absolute blast. Actually, I think I cheated a little on the ailerons and went beyond maximum, but I never missed my exponential, and I loved those perfectly axial rolls. This plane is never twitchy or jerky. The Lomcevak's are a slow motion ballet. Snaps are crisp, and spins stop the moment the sticks are released. Stall turns are more dependable than with any other plane I have flown. About the only thing I tried that I was unable to accomplish was a flat spin. Otherwise, I would rank the BalsaNova's aerobatic ability among the best.

tube that forces the exhaust gases through an array of holes into the outer can, then back through another array of holes into a different section of the tube and out again through yet another array of holes. This inner assembly is CNC-machined to very exacting specifications. When I used the Rony muffler, I gained 200rpm over the muffler that came with the engine, and it had a much more pleasing sound without adding any additional weight.

RADIO SYSTEM

Since the BalsaNova will most likely be selected by advanced or experienced sport flyers, I chose a radio system that this type of flyer would be likely to use or consider. The Futaba* 6XA is an entry-level, computer-programmable radio system. It has many of the features of more advanced computer radios, but it lacks the option for exponential control setups and has no timers. It does have dual rates for ailerons and elevator, but lacks dual rate for rudder. These features can be obtained in the 8UAP and 8UAF systems, but at greater expense and with more attendant complexity. Exponential controls are almost essential to the more radical fun-fly planes, and I have become addicted to them, but since the BalsaNova has more "normal"-size control surfaces (with the exception of the rudder), I didn't miss it at all on ailerons and elevators. I did, however, have to reduce the rudder throw to get a "softer" feel on that large surface, and wished I had exponential or at least dual rates there, especially on takeoff. I'm sure that even the simplest of radios would fly this plane without problems. I used Futaba 3001 ball-bearing servos on all the flying surfaces and a Futaba miniservo on the throttle.

FINAL THOUGHTS

Building the BalsaNova presented some challenges and some learning experiences. The resultant aircraft is a real winner. My hat is off to Tom Stryker and the Morris Hobbies BalsaNova for a job well done.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.

In the cockpit profile

I was excited. But it was more than that. As I sat there at the end of the runway, my feet spread wide to the rudders, left hand wrapped around the two big red throttle knobs, right hand grasping the characteristic control yoke, I was living out a dream. A childhood dream. I'd seen this image in my mind a thousand times, but was never sure I could make it real.

PHOTOS BY BUDD DAVISSON

A Dream Comes True

Editor's note: this pilot report initially appeared in Flight Journal, also published by Air Age Inc.

Flying the P-38 *Lightning*

by JEFF ETHELL



Lightning



The author in "Hog Heaven."

The big Allison engines on either side rumbled their impatience, but the sound wasn't of this time. It was the long-ago soundtrack of "A Guy Named Joe"—the accompaniment to the dream that someday I'd fly the fighter my father had loved so much in WW II. It had eluded me until this day, but as I started the throttles forward and felt the seat pushing against the small of my back, I was stepping over the threshold into an adventure that would leave its mark on me forever. More than



that, it would bridge the years and tighten the already firm bond between my father and me.

When Jack Erickson and his Tillamook NAS Museum in Oregon opened the door, after so many years of yearning, I had to fight back the dread it wouldn't happen, but he had *two* airworthy Lightnings on the field, so the chances looked pretty good.

When the day arrived, I stood transfixed before the newly restored olive-drab-and-gray P-38L-5. The P-38 defines the word "big" for WW II fighters—52-foot wingspan with operational weights up to 17,500 pounds, or more if needed. Preflight is very easy, since you can walk under every part of the airplane, which sits some 10 feet off the ground on massive landing gear. With twin, liquid-cooled engines, four radiators, four oil

coolers and the maze of hydraulics to run landing gear and flaps, the Lightning is very complex indeed, so there is plenty to check. Fortunately, Museum maintenance chief Ted Ryder is as much a fanatic on mechanical perfection as Jack, so this P-38—after about 13 hours total time since restoration—was operating virtually fault-free.

With a flick of a small lever, the handle for the boarding ladder pops out of the upper rear of the central gondola; one pull and it swings the ladder down then locks it into place. Getting up onto the airplane is then a series of embarrassing tries at sticking feet into the rungs, falling down and scrambling for the handhold just forward of the ladder handle. This took more getting used to than flying the plane. The final system boils down to right foot into the first rung, pull forward on the handle to get centered over the ladder,

left foot into the next rung and grab the handhold to pull forward for all you're worth while swinging the right leg up onto the wing. Everyone had his laugh for the day watching me try to cope with this thing.

Once I was settled in the cockpit, I was taken with the vast expanse of airplane around me. Sitting deep within the center gondola and wing, I quickly got the impression of being buried in the machine; this would intensify in flight. The cockpit is just about perfect in size: not too small, not too large and very comfortable. Having memorized the Pilot's Flight Operating Instructions, I was quickly familiar with the cockpit—absolutely mandatory before flying. The layout is a myriad of switches, and the labeling is often hard to read, particularly since most of the switches sit behind the

The most obvious difference from other wartime fighters—other than having two of everything for the engines—is the dual pistol-grip control wheel. Putting both hands on this thing brings a sense of complete authority.

control wheel. I can see why wartime instructors required a blind-fold cockpit check before turning people loose.

Jack, as if he'd come straight out of WW II as a transition instructor, gave me a few last-minute pointers like how to start it and what was different from a stock P-38; then he said, "Give it a try." He turned around, slid down the wing and climbed down the ladder, which I could hear retract with a firm clunk. He really must have had confidence.

The most obvious difference from other wartime fighters—other than having two of everything for the engines—is the dual pistol-grip control wheel. Putting both hands on this thing brings a sense of complete authority. I can see why it was so easy to haul the aircraft into tight turns; both biceps are working. The ergonomics of the wheel are also years ahead of their time: the grips are canted inward to the exact position of one's hands when they're relaxed and held out in front of you. Dad absolutely loved the wheel instead of a stick, because he could maneuver and point the four .50s and single 20mm like a fire hose.

The engine controls sprout from the left pedestal in all directions, so I carefully went over each lever, switch and propeller circuit breaker (these are Curtiss electric propellers). The large, red,

Lockheed P-38L Lightning

Wingspan: 52 ft.

Length: 37 ft., 10 in.

Height: 9 ft., 10 in.

Max. takeoff weight: 22,000 lb. (14,000 lb. basic combat wt.)

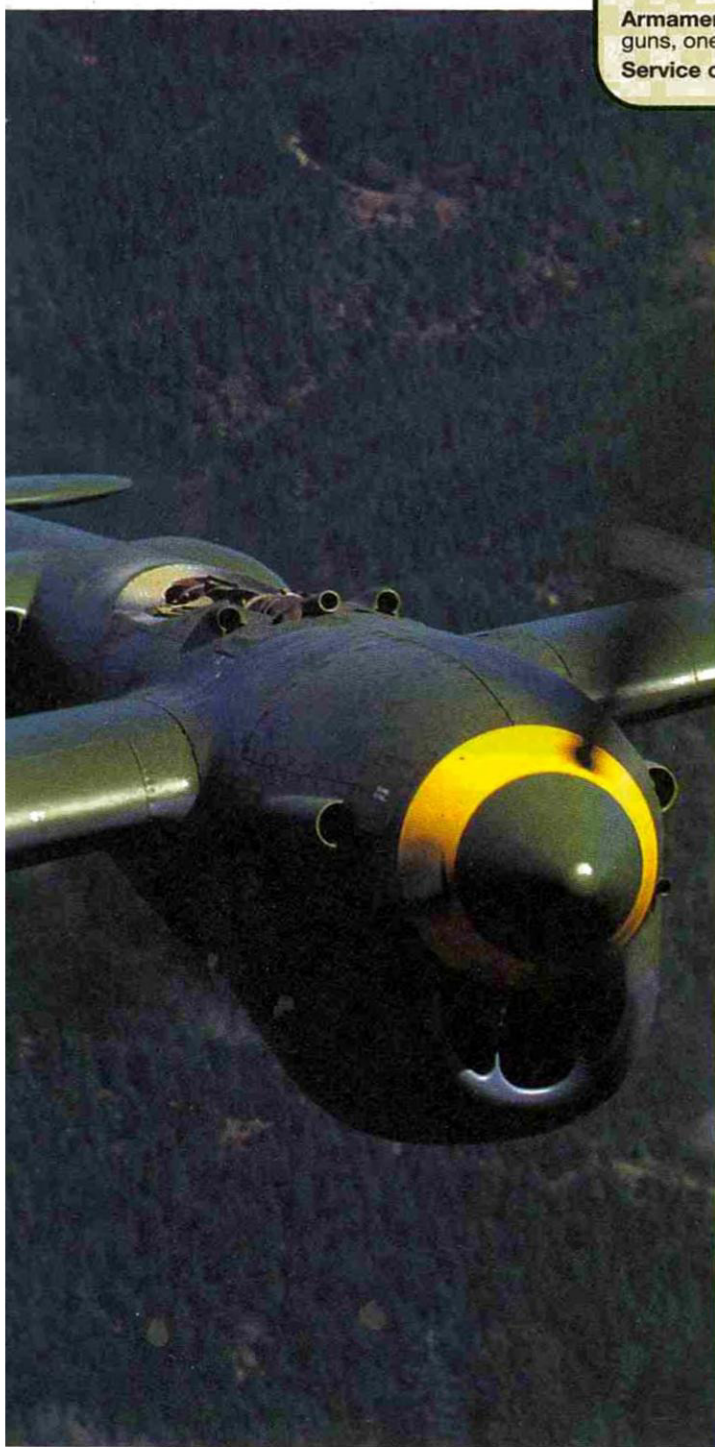
Total wing area: 220 sq. ft.

Max. speed: 414mph at 25,000 ft.

Range: 2,000 miles

Armament: four 0.50 in. machine guns, one 20mm cannon

Service ceiling: 44,000 ft.





On base-leg turn, with flaps at maneuver stop, the author sets up to land at Tillamook NAS, Oregon.

round throttle knobs are an ideal size for the left hand, completing the sense of total control given by the wheel grips. The fuel-tank selectors are mounted on the floor, one in front of the other, to the left of the seat—left wing fuel forward, right wing fuel aft. This has been the cause of most P-38 accidents in the past 30 years. Not only can one get confused about which tank one is selecting, but the five detents include an off position that also doubles for the drop tank. Pilots have often selected a position either between the detents or the off/drop tank position with no tanks, starving the engines of fuel. I took several minutes to look down and memorize the positions and the feel of the selector handles.

With nothing else to look at, the inevitable had arrived. Before-start checklist: battery on; fuel selectors reserve (the carburetor vapor line returns several gallons an hour here); if carrying drop tanks, the bomb selector switches go on with arming switch to safe, but they are not hung today; throttles $\frac{3}{4}$ -inch open; props full forward; prop selector switches auto; mixtures idle cut-off; oil-cooler flap switches auto; generator switches on; coolant-flap override switches off (auto); intercooler flaps open; fuel-quantity check.

Engine start begins with the left, then the right engine boost

pump on and normal; ignition master on; magneto both; starter switch hold forward (left engine) with middle finger of right hand until maximum inertia. Like most Allison-powered WW II aircraft, a flywheel is spun up and then engaged. While still holding the inertia starter, the third finger pushes the engage switch forward at the same time the index finger holds the primer! At first, this is a real comedy of twisted fingers and contorted muscles since you have to reach under or over the control column to get to all this stuff while the left hand is poised on the left mixture control. Much to my delight, the Allison started very smoothly. I brought the mixture up, and the engine settled down into that distinctive P-38 collected exhaust rumble. Repeat this for the right engine (except the starter and engage switches are held rearward), and the same satisfying start takes place. Dad would confound his students by starting both engines at once; this had to be a real trick. Over the next several days of flying, the sequence became quite natural without a single mis-start. In the P-38, those Allisons start about as easily as a car engine, but they are more difficult to get going in the P-40 and the P-51A. I have no idea why:

Sitting there with both turbos whirling, feeling and hearing the



satisfying, deep-throated growl coming from the top of the booms (on either side of the ears) is absolutely mesmerizing. There is no sound like it. Looking at those spinning props, across the broad wings, I had to be dreaming.

Off the brakes and the Lightning moves easily away, even at low rpm. Like all WW II tricycle-gear types the nose wheel is non-steerable, so it casters in response to throttles or brakes. I quickly discovered that the massive rudders pick up the prop blast at low speed, so very little brake is needed; just push the rudder pedal, and it steers as if the nose wheel is hooked up. The brakes don't have the bear-trap power of the B-25, but one can get a bob and weave going when pushing on them too hard. Differential throttle is the primary means of steering, and what a great thrill to hear the "rrrrRRRRUMMMPP" of the exhausts with each application of throttle.

Run-up at 2,300rpm (once each engine has at least 40-degree C oil temp) is simple because the propeller

Warbird lore is filled with tales of vintage airplanes supposedly hidden away in some eccentric farmer's barn—very entertaining, but with no foundation. However, it happens to be true in the case of Bruce Pruett and his Lockheed P-38 Lightnings, minus the eccentric farmer part.

Pruett's interest in becoming a warbird owner started in 1963 after he moved to Livermore, California, to take a job as a physicist at the prestigious Livermore Laboratories. He inquired about a P-40 for sale nearby, but the \$10,000 asking price was highly inflated for the times. Pruett then began building and flying radio-controlled model airplanes—an expensive hobby. It wasn't long before he realized the "real thing" only cost a few dollars more than he was spending on his models. He remembered an advertisement he had read a couple of years back in "Trade-a-Plane" concerning five photo-mapping P-38s being sold by Mark Hurd Aerial Surveys of Santa Barbara, California. Then, a friend who had just returned from the Santa Barbara area told Pruett that three of the Hurd Lightnings were still for sale. He wrote to the survey company with a request for additional details of the sale and later, through a series of phone calls and visits, he purchased two of Hurd's modified Lightnings for essentially scrap value.

The two aircraft were manufactured by Lockheed in the Spring of 1945 as P-38L-5-LOs, serial numbers 44-26969 and 44-27083, then sent to Dallas, where they were converted to photo recon F-5G-6-LOs before being transferred to Tinker Field, Oklahoma. In January 1946, both aircraft were dropped from the U.S. Army Air Forces' inventory after being delivered to the Kingman storage facility in Arizona and were sold to civilian buyers. When Pruett bought them, neither was airworthy, so he had to figure a way to get his P-38s home. He had originally made arrangements with an FBO in Santa Barbara to make one airworthy so it could be ferried to Livermore. These plans fell through when the FBO raised the price of the job by a factor of five. Pruett attempted to use other means of transportation to move his Lightnings, but all proved to be too expensive, so he began taking the airplanes apart without the aid of power tools. It took Pruett approximately 100 days to dismantle and transport his Lockheeds to Northern California.

Over the next 25-plus years, Pruett collected parts and worked on the planes when he could. As time passed, his initial investment grew in value and attracted more and more attention from warbird collectors who wanted to add a Lightning to their stable. They also attracted the attention of souvenir hunters and thieves who once broke into Pruett's storage barn and made off with some valuable parts. Fortunately, the thieves were caught when they attempted to sell their stolen treasure. Some time later, Pruett slowly began to move the parts of his Lightnings to a larger garage he had built on top of a mountain near his new home. The new storage facility is connected to civilization by a narrow, winding road that is a challenge to any vehicle.

In 1990, Jack Erickson of Medford, Oregon, approached Pruett, offering to buy one P-38 and restore both of the Lightnings to airworthy-status. Initially, Pruett did not accept the deal, but the more he thought about it, the more it appealed to him. The terms of their agreement were finalized in early 1995, and in less than 18 months, Bruce Pruett's 30-year dream of getting his P-38s back in the air became a reality. Bruce has decided to base his Lightning, along with Erickson's, at the Tillamook Naval Air Station Museum on the Oregon coast west of Portland, making it the only museum in the world with two P-38s, much less two airworthy P-38s, on display.

Over the years, Bruce Pruett—not a man of great wealth—was harassed and maligned by individuals who did not understand his dedication to a cause. He should be congratulated and admired for saving two of the rarest warbirds in existence today.

—A. Kevin Grantham

Pruett's Lightnings



One of Bruce Pruett's P-38s under restoration at Medford, Oregon. (Photo courtesy of Jack Erickson.)

Lightning

selector switches are behind the prop levers: switch to manual, pull back to decrease rpm a few hundred, push back up to 2,300 and flick the switch back to automatic. During the War, the props were known to run away, but this was usually due to corrosion when the aircraft were left outside. On the whole, they were very reliable, but part of the drill is to be ready to reach up and pull them out of automatic to manual if the rpm go above 3,000 red line.

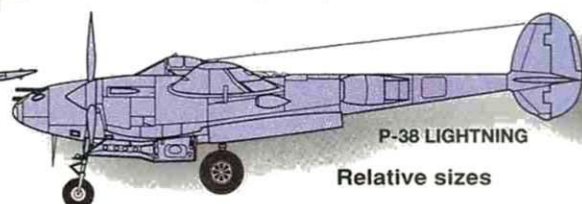
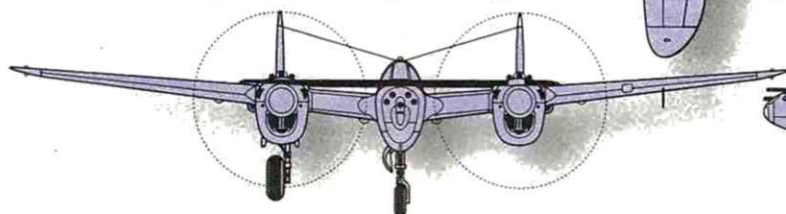
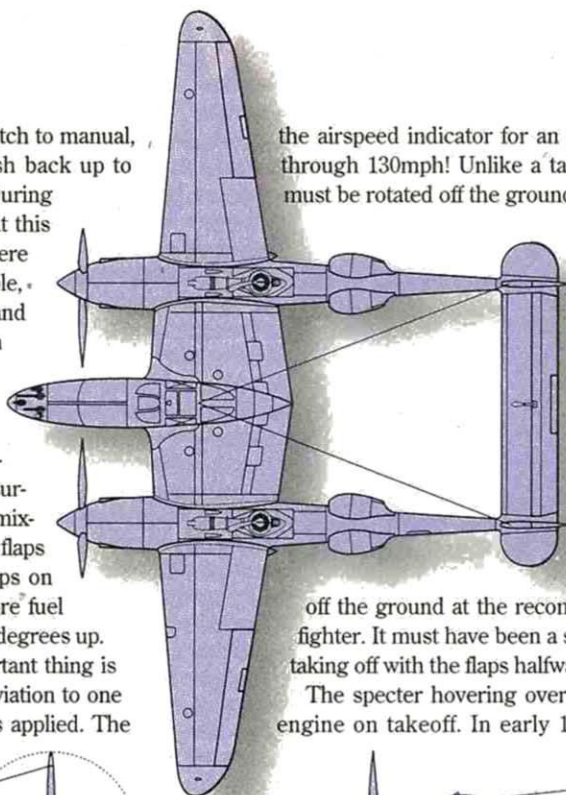
Before takeoff: top hatch locked; side windows rolled up (they're like car windows), and engage the locking ratchet (if left open, they create enormous turbulence across the horizontal surfaces); props full forward; prop selectors auto; mixtures auto rich; fuel tank selectors reserve; dive flaps up; wing flaps up; aileron boost on; boost pumps on and emergency (this gives about 10 pounds more fuel pressure); rudder trim 0 degrees; elevator trim 3 degrees up.

Once lined up on the runway, the most important thing is to have the nose wheel straight; the slightest deviation to one side will make it really lurch when the power is applied. The

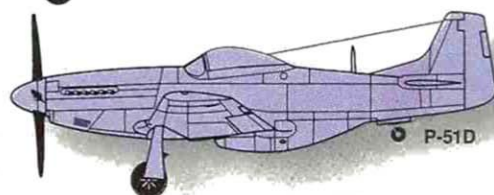
the airspeed indicator for an update—YOW!! I was passing through 130mph! Unlike a tailwheel aircraft, the Lightning must be rotated off the ground, or it will simply stay glued to the runway. I pulled back, shot into the air and fumbled for the gear handle on the lower portion of the engine control pedestal. The P-38 immediately clawed for altitude as I brought the power back to 44 inches and 2,600rpm for climb. It took a couple of takeoffs to get used to this, but eventually, I was able to react quickly enough to get the nose wheel

off the ground at the recommended speed and rotate the fighter. It must have been a superb short-field aircraft when taking off with the flaps halfway down.

The specter hovering over this exhilaration is loss of an engine on takeoff. In early 1942, when Dad and his 14th



Relative sizes



3-VIEW BY LLOYD S. JONES

view forward is wonderful; unlike in the tail-wheel types, runway visibility is totally unobstructed. Hold the brakes, open the throttles. During the War, the drill was to go to full power, let the turbos stabilize, see if the props were going to run away, then let go. It must have been like a rocket because all I did was go up to 30 inches manifold pressure, glance at the engine instruments, and release—*wham!* The P-38 shot out from under me as I kept moving the power up to 54 inches and 3,000rpm. The first thing I noticed was absolutely no torque and perfectly straight tracking—heaven with 3,000hp screaming into my ears and a wonderful feeling of being pressed back into my seat.

The manual recommends easing back on the control column at 70mph, lift off between 90 and 100mph, retract the gear and accelerate to 120mph safe single-engine speed. After what seemed like a few seconds, noting a steady 3,000rpm, I thought I'd take a look at



Fighter Group friends transitioned into the P-38, they had, on the whole, absolutely no twin-engine time. They were fighter pilots, weren't they? In short order, pilots were getting killed when one engine quit and the P-38 rolled over onto its back and into the ground. Soon, Lockheed test pilots Milo Burcham, Tony LeVier, Jimmy Mattern and others were showing new P-38 pilots how to bring back both throttles, get the nose down and maintain control while trimming out the yaw and bringing the power back up on the good engine, feathering the prop of the dead engine and accelerating to 120mph. This may sound a bit daunting, but during a few single-engine drills at altitude, I found the P-38 responds wonderfully to each input and flies away without a whimper. A Lightning will fly single-engine at 255mph true air speed at 20,000 feet—quite impressive indeed.

Best climb is somewhere between 140 and 180mph, and this plane really climbs. The wartime technique was a shallow, high-speed climb, which would outdistance almost any enemy fighter. And what a wonderful experience not to have to hold strong right rudder; feet on the floor, relaxed, I was in paradise. After a few tentative turns, with absolutely no pressure from the ailerons, I was beginning to comprehend why everyone loved the Lightning so



much: it flies like a jet with no vibration and light controls.

Level off, power back to 30 inches and 2,000rpm, mixtures to auto-lean, boost pumps to normal, fuel selectors to main tanks. What a sight! Within the wing, I felt as if I were being absorbed by the machine—becoming a part of it rather than riding in it. One of the weak points of the design comes across right away: the engines and wings on each side really block the view down. The only way to keep one's scan up is to roll the airplane into a steep bank and then roll back, which doesn't do wingmen much good in formation. I can see why mutual scan among flight members was so critical. My first few turns were effortless; the aileron boost makes an enormous difference. Unlike with a jet, the turns have to be coordinated with a firm push on the rudders, which are stiffer than both ailerons and elevators. Without wasting any time, I decided to do the one thing I had wanted to do more than any other: a barrel-roll—Dad's favorite maneuver. Nose down for a little extra speed, pull back, turn the wheel and push the rudder pedal. The P-38 glided through just as wonderfully as I thought it would. Another, even better. Another, perfection. With one hand on the wheel and the other on the throttles, it's just as easy. With both hands on the wheel, I pulled it into a tight turn and was delighted to find the elevators almost as light as the ailerons. Making tight turns and loops was so easy that I grinned involuntarily. When going over the top of the loop, no right rudder was needed at all; just keep the feet on the floor. This was becoming far too easy.

The single dominant impression is this thing is *smooth* and effortless to fly—quite unlike the more complex warbird types. Managing both engines quickly becomes second nature. Stalls are docile; just a rumble as the airflow starts to break up and move toward the wingtips—no tip-stalling tendencies. To recover, just relax backpressure and fly away while shoving the throttles to full power with no worry of a snap-roll. At a 15,000-pound gross weight, a power-off gear- and flaps-down stall is 70mph! Those Fowler flaps are superb. While flying formation with the Cherokee Six camera ship, I was full of trepidation. The last time I did that in a Mustang, I held a bootful of right rudder, hanging on the ragged edge of a reduced power-on stall. At 100mph, I could hang the P-38 on its props, feet on the floor, and gently move the rudder to slide side to side.

Within an hour, something quite astonishing and

By the time I was three years old, I knew what a P-38 was. At that time, my Dad, Erv Ethell, was commander of the 39th Fighter Squadron, which was equipped with P-51 Mustangs at Johnson Field, Japan. I thought everyone's Dad had a ramp full of Mustangs. He loved the P-51 and, later, the F-86, but as my childhood years progressed, he talked most about his love for the Lightning—his WW II combat mount in which he claimed four confirmed kills and one probable. I would sit down with his WW II scrapbooks and for hours let myself be transported back to the life of this young man I would never know except through the eyes of

someone who had turned into my father.

My very first try at writing came about this time; it was a fictional short story about P-38 pilots in North Africa—wonder where that inspiration came from? When I first timidly showed it to Dad, he thought it was pretty goofy, and it was! I never dreamed it was a preview of my career; I simply loved the P-38 so much I had to write about it—the technique that continues to drive my writing to this day. Truth be known, I hate to write. It's sheer agony. Writing is simply punishment for getting to fly.

Before I was a teenager, I knew the P-38 was the airplane I wanted to fly more than any other. I would sit for hours and gaze at photos of P-38 cockpits with those two different styles of control wheels. It haunted me through my first solo, my commercial and instrument ratings, then the dozens of warbirds I have flown since first flying the Stearman.

No need to question my love of all military aircraft (that comes out in my articles), but the P-38 hung in the background of my subconscious—nagging me.

Then came Jack Erickson. When Teleteam, the company with which I produce the Roaring Glory Warbirds checkout tape series, was trying to round up a P-38, we hit one roadblock after another, and for good reason: I had no experience in type. When my good friends Fred and Bill Burton (father and son) heard about our plight, they sent some of my tapes and my "experience summary" to Jack, who looked the stuff over and called me, offering his newly restored Lightning, which had been saved for so many years by Bruce Pruett. I had never met or even talked to Jack. He quietly said that if I was going to fly it, I had to keep the big secret: this bird was easier to fly than almost any twin. He didn't want it to get out that teenagers with 200 hours could actually fly them in combat. He made it clear he thought I was more than qualified. The conversation lasted all of a few minutes and was so matter-of-fact (typical of him, I was to find out) that the rest of the day, I was numb, wondering if it would really happen. As you've read, it did. Out of the sheer blue, God, in His graciousness, laid the dream of that yearning young boy at my feet.

—Jeff Ethell



Capt. E.C. Ethell, Van Nuys, California, 1944.

Following in the footsteps

Lightning

totally unexpected, began to happen. Not only was I more than comfortable, but the airplane also began to "shrink" around me in my mind. The wings seemed to get smaller, the engines went almost unnoticed, and I was soon flying only the central pod with its guns sticking out front. The sense of power, freedom and effortless control movement is so visceral the machine becomes a part of you. As this dawned on me, I was abruptly sharing the cockpit with young Lt. Erv Ethell. His recollections of handling the P-38 in combat became my own; his hands were my hands. The generational circle closed around me as I soared above the Oregon coastline and I began to talk to him, even though he was 2,500 miles away.

Without much thought, I was entering his preferred combat maneuver; power up, I pictured a 109 on my tail and began an increasingly steep right-hand climbing turn. In turning and twisting with 109s and 190s, Dad never got a bullet hole in *Tangerine*, his P-38F. As the speed dropped below 150mph, I flipped the flap handle to the maneuver stop (which can be used up to 250mph) and tightened the turn. At this point, the 109 pilot, at full power with the right rudder all the way down, would have snap-rolled into a vicious stall if he had chosen to follow. I pulled the power back on the inside (right) engine, pushed the power up on the outside (left) engine, shoved right rudder pedal, and the Lightning smoothly swapped ends. Not only did it turn on a dime, but it actually rotated around its central axis as if spinning on a pole running through the top of the canopy and out the bottom of the cockpit. The maneuver was absolutely comfortable with no heavy G-loading. As the nose came through 180 degrees, I threw the flap lever back to full up, evened the throttles and headed downhill going through 300mph in less time than it takes to tell it. The 109 would have been a sitting duck.

This transitional performance is what made the Lightning great in a dogfight; it gave it far more versatility than a single-engine fighter. No doubt, if it were flown like a single-engine fighter, it would come out on the short end, but when a pilot learned to use everything available to him, it was stunningly dangerous to the enemy. One final characteristic made all this worthwhile: there was no converging fire from the wings. A P-38 pilot could get all of his guns on target whether it was 10 feet or 1,000 yards away. Bong and McGuire were sold on this combination, convinced they were flying the finest fighter of the War. They had no hesitation at going round and round with Zeros and Oscars, which were supposedly more maneuverable.

However, once going downhill, the other Achilles' heel of the Lightning comes out: compressibility. I never got there, but I passed 400mph in a dive without much time to think about it. There's a dive-limit placard in the cockpit, and using it was absolutely mandatory. The Pilot's Instructions state, "As the airplane approaches the critical speed, it becomes rapidly nose-heavy and starts to buffet as if it were about to stall. If this condition is allowed to develop, the nose heavy condition will become more pronounced, and it will be very difficult to pull out." Many never pulled out. Fortunately, the P-38L had dive flaps—large electrically driven surfaces under each outside wing that deflected no matter what the speed. I hit the switch on the wheel and, with no pull on the wheel at all, the plane pulled out and pitched up into a shallow climb. When I retracted the flaps, the nose pitched down into level flight—all with no input. Unfortunately, dive flaps did not come along until the late J Series—about the same time as the aileron boost—but far too late for most who had flown the P-38 in combat.

Another bugaboo with the Lightning was bailing out and hitting the horizontal stabilizer; actually, it wasn't that prevalent. There



were several methods: (1) slow down to around 110mph with full flaps if possible, crawl out of the cockpit and slide headfirst down the wing; Lockheed said you'd miss the horizontal stabilizer by four feet; (2) roll over with elevator trim forward and fall out; (3) at high speed, just pop the hatch and get sucked out.

Reluctantly, I had to head back to Tillamook; after beating up the west coast of Oregon, I had run out of ideas. Initial for an overhead fan break: 360 degrees overhead approach at 250mph; fuel-tank selectors on main or reserve (whichever is fullest); mixtures to auto rich; props to 2,600rpm; boost pumps on and emergency. Racing across the numbers, I pulled up and left into the break. Move flap handle to the maneuver stop; gear down below 175mph; 50 percent flaps at 150mph and settle into the downwind. From base to final, bring the power back to 18 inches and stabilize at 140mph. With the field made, add full flaps, bleed airspeed down to 120mph; over the fence at 100 to 110mph, but never exceed 100mph on touchdown or the P-38 will really eat up some runway. Both throttles to idle and pull the wheel back. That first landing at around 80mph felt like setting a baby carriage down with a satisfying squeak—way too easy. Hold the wheel back for aerodynamic braking, then lower the nose; we haven't gone much more than 2,000 feet. Absolutely amazing.

With one engine out, the landing technique is similar with the following exceptions: 160mph and 1,600 feet on downwind, aileron boost off to conserve hydraulic power, 50 percent flaps at 140mph; partially reduce rudder trim, approach no slower than 130mph. At 44 inches and 2,600rpm, the P-38 will barely hold altitude with gear down and flaps up and will not hold any altitude even with some flaps extended. Do not extend full flap until closing the throttle on the good engine for landing. Below 500 feet with full flaps, you *must* land as it will not make a go-around.

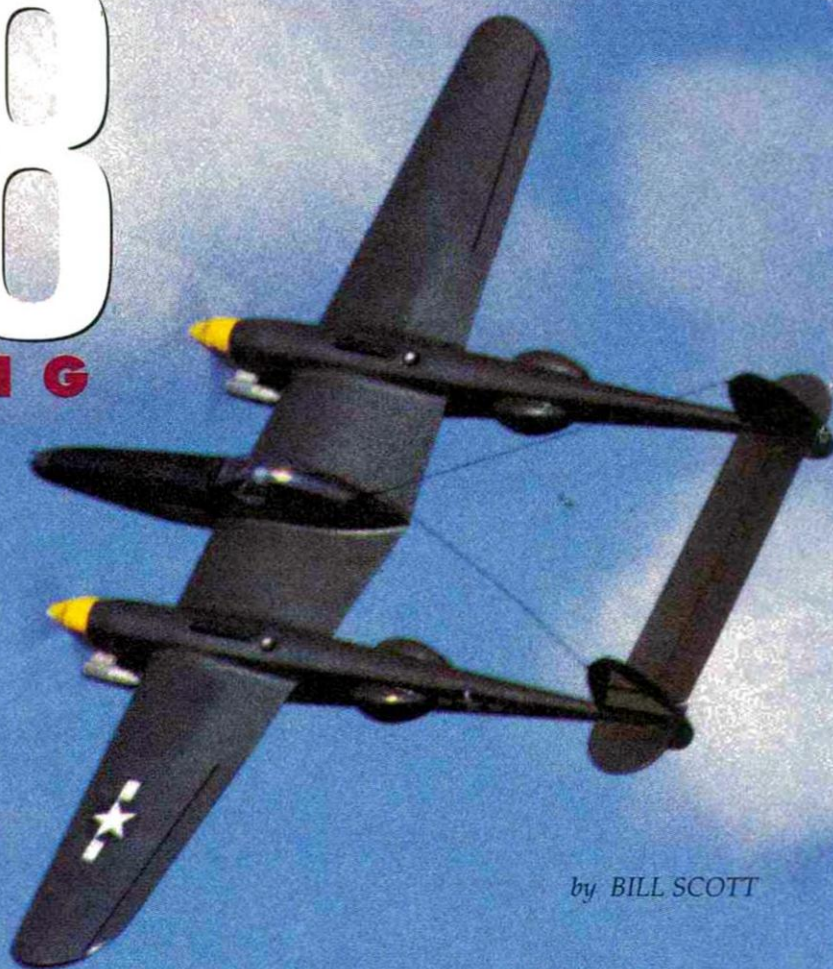
Off the active; brake to a stop; flaps up; coolant flaps full open; boost pumps off. Back to the parking area, throttles up to 1,200 rpm; stabilize temperatures; mixtures to idle cut-off; mags off; battery off. I have come full circle. Reigning back some obvious prejudice from growing up with Dad's memories, I have come to see the P-38 in a far different light. There is little doubt in my mind I have flown the finest American fighter of WW II. It may have taken a little more time to master and certainly was more complex to maintain in the field, but the options available to the Lightning pilot were impressive. A talented, aggressive fighter pilot could clearly make the P-38 sing. I count myself fortunate to have heard, at last, that siren song.

+

P-38

LIGHTNING

*A 1/12-scale twin-tail
devil for combat!*



by BILL SCOTT



The author shows off his twin-tail Lightnings. The only problem Bill has with these combat models is that they're too pretty to commit to combat!

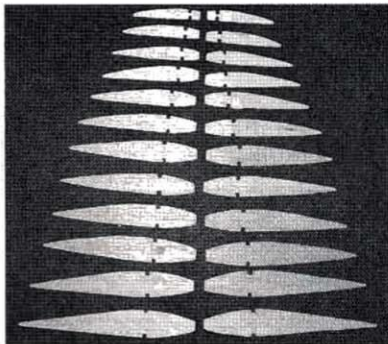
"DER GABELSCHWANZ TEUFEL," the "fork-tail devil," is the name World War II Luftwaffe pilots gave the feared P-38 Lightning. This innovative design developed in Lockheed's newly formed Skunk Works was successful wherever it was used. And it was used everywhere. The Lightning shot down more Japanese aircraft than any other fighter of the War. This late '30s art deco design is immediately recognizable and arguably the best-looking of all the heavy-metal warbirds, making it an excellent modeling subject.

I love R/C combat and felt that a 1/12-scale P-38 would be a great combat plane. As a rule, combat planes must be strong, light, maneuverable and fast. I'm pleased to say this plane does it all! The only problem is I like it too much to risk it in combat!

WINGS

The wing is the component that all the other parts fasten to, so construction begins with it. The wing consists of 12 different size ribs, and you'll need to make two of each. All ribs are cut from 1/16-inch balsa sheet, except for the center "L" ribs, which are 1/8 inch thick. Before building the wing, drill 1/2-inch-diameter holes in ribs I, J, K and L. This allows servo wires and battery leads to be installed after the wing and booms have been built. The wing is built in halves and then joined together to form the proper amount of dihedral.

Starting with the right wing panel, tape the 3/16-inch spruce spar into place over the plans. Glue ribs A-K into place, and then add the top 3/16-inch spruce spar followed by the LE. I used a preshaped LE (Midwest* no. 6909 LE stock) centered on the front of the ribs.



The wings are tapered so you have 12 pairs of ribs to cut out.

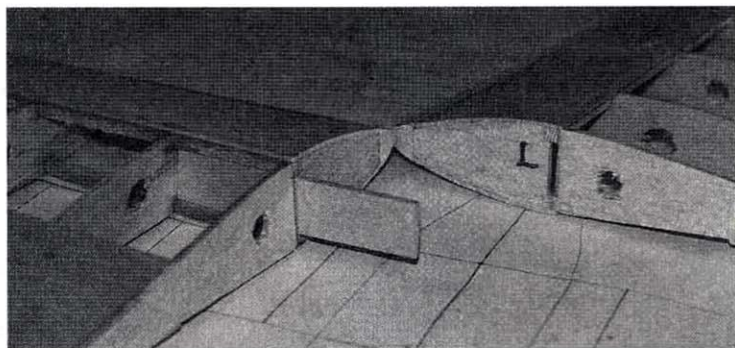
Cut the ailerons from the TE stock (Midwest no. 6812) as shown, and put them aside for now. Make a pair of aileron torque rods from 1/16-inch music wire and 3/32 inch-o.d. brass tube as detailed on the plans and install, noting that the servo ends of the torque rods point downward.

Ensuring a good fit, glue the TEs with torque rods installed to the wing panels. Make the dihedral brace from 1/8-inch plywood and cut an 1/8-inch slot in the L ribs. Test-fit the brace and wing halves together, and when satisfied with their fit, epoxy and clamp everything together until cured. Install the

1/8-inch balsa shear webs between ribs D and K, and install the 1/16-inch balsa TE vertical stiffeners from ribs L to I.

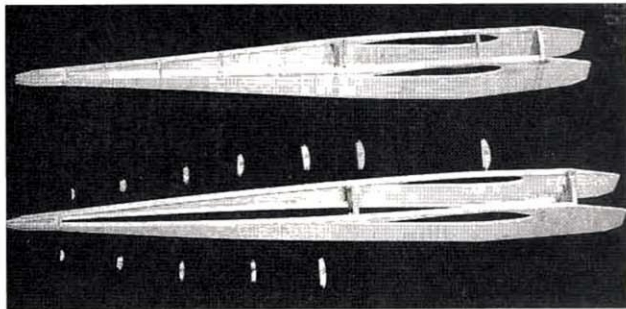
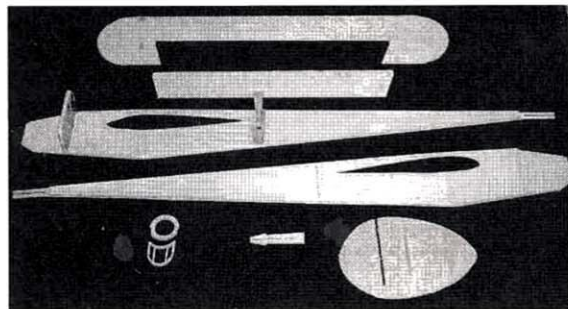
Complete the sheeting on the top of the wing, but do not finish sheeting the bottom of the wing until the booms and wiring

Here, the wing panels are ready to be glued together. A plywood brace strengthens the center wing joint. Note that the centers of the wing panels are not sheeted at this point.



Now glue the 1/8-inch-square balsa piece to the trailing edge of the ribs. Using the dihedral guide shown on the plans, install the center L rib and glue into place. Glue the 1/16-inch balsa LE and TE top sheeting into place, and when the glue is dry, turn the wing over and add the bottom LE and TE sheeting. Now build the left side wing panel in the same way.

have been installed (see photo). Cut out and glue on the wingtip blocks, then sand the entire wing smooth. Cut slots in the sheeting in front of the aileron torque rods to allow the rods to lie flush on the wing when the booms are slid into place. Hinge the ailerons into place, but don't glue the hinges in until after the model has been covered.



Far left: here are the boom and tail parts ready to assemble. Left: the tail booms assembled. Note the small formers used to round the top and bottom surfaces of the booms.

SPECIFICATIONS

Name: P-38 Lightning

Type: Twin, 1/12-scale combat/sport model

Wingspan: 49 1/2 in.

Length: 36 3/8 in.

Weight: 3 lb., 3 oz.

Wing area: 352 sq. in.

Wing loading: 21.25 oz./sq. ft.

Airfoil: semisymmetrical

Radio req'd: 3-channel (throttle, elevator and ailerons)

Engines req'd: two, .10 to .15 2-strokes

Engines used: O.S. Max .15

Features: the P-38 is all balsa and plywood construction. The booms are built separately and then slid onto the built wing. The fuselage pod is built on the wing before the wing sheeting has been completed.

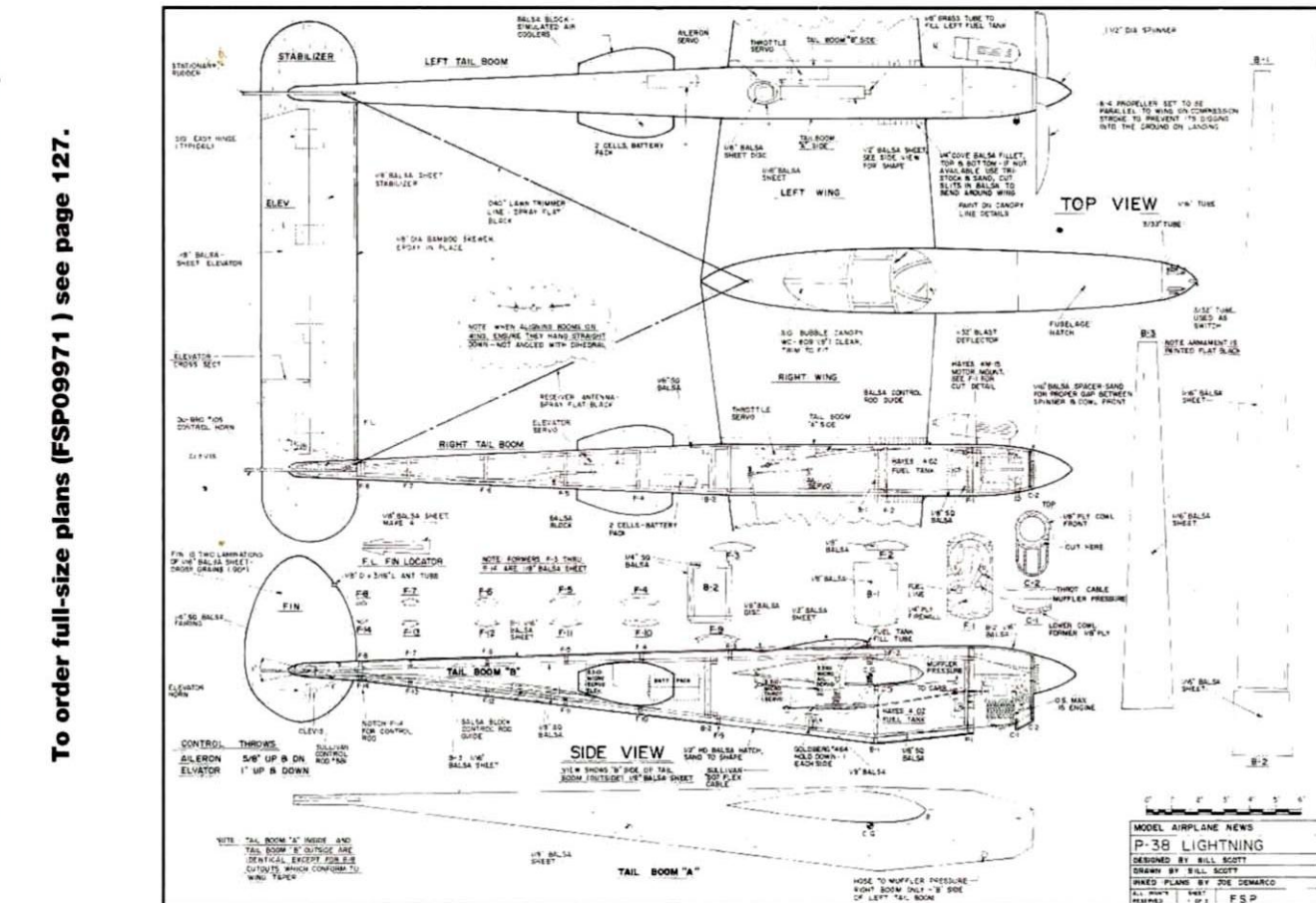
Comments: overall, the P-38 makes a good sport model as well as a screamin' 1/12-scale combat model. It is a smooth and fast flyer. Engine-out performance is good, but airspeed must be kept up.

TAIL ASSEMBLY

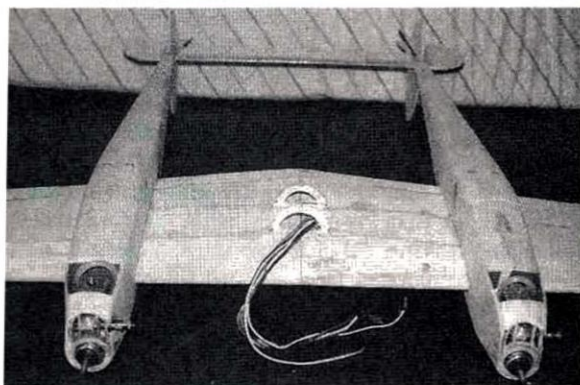
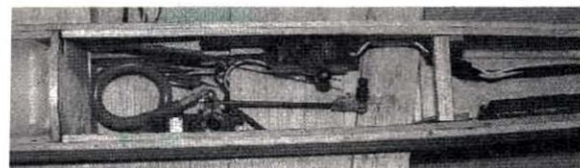
The horizontal stabilizer and elevator are made from 1/8-inch hard-balsa sheet. Note that the stab's LE is notched so a long bamboo skewer can be inserted to stiffen and strengthen the stab. The fins are cut from two sheets of 1/16-inch balsa that have been laminated together in a cross-grain pattern.

TAIL BOOMS

Cut out two each of the A and B boom sides. Sides A and B are identical except for the rib cutout patterns, which are different sizes so the taper of the wing panel will fit properly. Also, cut out formers F-2 through F-14, and bulkhead B-1 from 1/8-inch balsa. Cut out firewall F-1 from 1/4-inch plywood, and drill the holes for the engine mount and fuel lines. Use blind nuts to hold the engine mounts in place. I used Hayes (distributed by Carl Goldberg Models*) KM15 mounts in the prototype. Cut the engine mounts apart as shown on



To order full-size plans (FSP09971) see page 127.



Above top: one of the booms attached to the wing. Visible are the fuel tank, throttle servo and aileron servo with torque rod attached.

Above bottom: with both booms and the tail attached, the servo wires are brought to the center of the wing and the wing sheeting can be completed. Note that formers F-5 and F-6 for the pod have been installed before the sheeting was completed.

the plans, and then drill and tap the mounts for the engines you'll be using.

Cut the cowl formers C-1 and C-2 out of 1/8-inch plywood, and then cut C-2 apart as shown on the plans to form the cowl intake and the spinner-ring portions. Now cut the four "FL" fin locators out of hard-balsa 1/8-inch sheet, and make bulkhead B2 from 1/4-inch-square balsa.

Mark the inside of the tail-boom sides for the placement of formers as well as the fronts of the "FL" fin locators. After that,

glue the 1/8-inch-square longerons into place. Epoxy former F-1 on tail-boom side B, and when cured, glue the 1/8-inch-square balsa reinforcements into place behind it. Glue bulkhead B-2 and the fin locator to side B, then fit side A to side B. When everything fits together properly, glue everything together. Add the remaining 1/8-inch-square balsa reinforcements, and then glue formers F-2 through F-8 onto the top of the booms. Glue formers F-9 through F-14 into place on the bottom of the tail booms.

Sheet the tops of the tail booms with 1/16-inch balsa from the center of former F-1 to F-8 using template B-1 shown on plans as a guide.

Sand and blend the top sheeting and the sides together until smooth. Next, fuelproof the firewalls using thinned epoxy, then install the engine mounts. Install the outer sleeve of a Sullivan* no. 507 throttle cable through the firewall leaving 3/8 inch sticking out in front, and then CA it into place. Install the engines on the mounts, then epoxy the top half of former C-2 into place between the boom sides and clamp as needed until the glue has cured. Now sheet the top of the cowl front with 1/16-inch balsa (use tem-

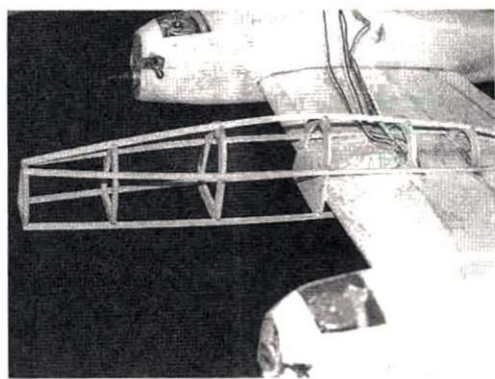
plate B-2) and remove the engine. Now fuelproof the entire engine bay area. Reinstall the engines and slide the throttle cable into the cable tube and attach throttle linkage. Now epoxy and clamp the lower part of C-2 into place. After it has dried, epoxy lower cowl former C-1 into place. When dry, add the lower cowl sheeting and sand everything smooth.

ASSEMBLY

Slide the tail booms into place on the wing, and trim the rib cutout as needed for a proper fit. Now slide on the horizontal stabilizer and fins, and make sure that the tail booms hang straight down relative to the wing's dihedral. Check all the parts for proper measurement before gluing everything into place.

I used two Hayes 4-ounce fuel tanks and I used a three-line fuel system. The third

The basic pod takes shape with the addition of five stringers and the rest of the pod formers. Keep everything straight.



FLIGHT PERFORMANCE

• Takeoff and landing

For initial flights have someone launch the model for you. He should

hold it by the center pod and give it a light toss into the wind. The Lightning has plenty of power and will be flying as soon as it is released. Once you have it dialed in, you'll find you can launch it by yourself.

For landing, make your turn to final at about 30 feet altitude while having the engines at idle. Let the plane sink naturally, and when lined up, pull the throttle trim all the way back to cut off the engines. Let the plane sink until about a foot off the deck, and keep feeding in up elevator until it lightly slides in. Normal landing slide is about 5 feet, but with wet grass, figure about a 30-foot slide.

• High-speed performance

If you have the need for speed, this is your bird! This P-38 rocks and rolls. It has vertical performance to spare. High speed turns are razor sharp and can be really tight—good for combat! If you resist a high speed, ground-attack low pass, you have more will power than me.

• Low-speed performance

The Lightning will slow down pretty well. If you get too slow, border-

ing on stall, it gets a little mushy. This can be easily remedied with the application of throttle. I've almost hovered it in a light wind.

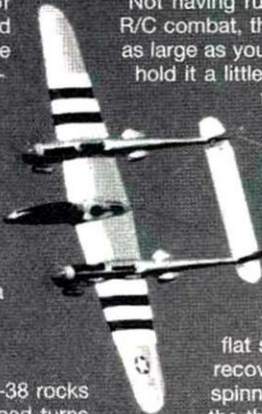
• Aerobatics

Not having rudder control, the model is a little limited. But for R/C combat, there's plenty of maneuverability. You can do loops as large as you please. The first snap roll is pretty fast, and if you hold it a little longer, the second and following snaps are even faster. Rolls are pretty axial, and inverted flight takes only a slight amount of input to maintain level flight.

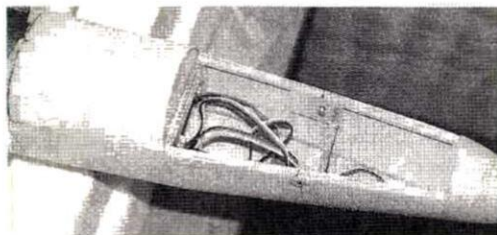
• One-engine operation

What happens when an engine goes out? Most engine-outs occur when one engine is set too lean and while you are in a climbing or vertical attitude. The first time this happened to me, the model snapped and went into a fast, flat spin. It doesn't, however, lose a lot of altitude. To recover, I pulled back to idle and the model stopped spinning and began flying again. At this point, I pushed the throttle back up to about 1/3 and the P-38 remained controllable but tended to drop the engine-out wingtip.

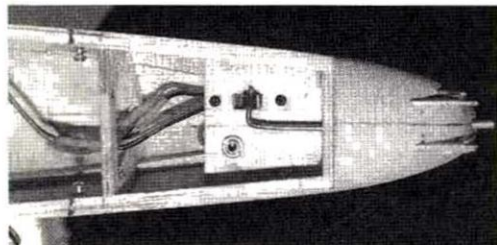
This is correctable with aileron input. Keep all turns smooth and large because the model will snap with any major loss of airspeed. If you lose an engine, keep flying the model, and when you have your model positioned properly, shut down the remaining engine and land.



P-38 LIGHTNING



There is a hatch built into the top front of the pod for access to the radio.



The radio on/off switch is activated by pulling or pushing the center nose gun in or out.

line is for filling only and has a small check valve installed to allow the muffler-pressure system to work properly. Pack foam in the tank area to support the tank, then glue bulkhead B-1 into place and check that the fuel lines are not pinched or kinked. With the tank and B-1 in place, sheet the boom bottom from the firewall to B-1.

Install the elevator servo in the right tail boom, and run the elevator control rod from the servo back to the notched F-14 former. I used a Sullivan no. 581 rod. Connect the inner rod to the elevator servo and leave 4 inches of the rod extending past former F-14. Install the remaining servos, and connect the two throttle servos together as well as the two aileron servos together with Y-harnesses. Bring all the servo leads together at the center of the wing. Finally, using template B-3 as a guide, sheet the rest of the boom bottoms with $\frac{1}{16}$ -inch balsa. Sand and fill as needed until smooth.

Make the two bottom hatches (located between formers B-1 and B-2) from $\frac{1}{2}$ -inch hard balsa and sand to shape. I used Goldberg 90-degree hold-down brackets to hold the hatches in place. Now add $\frac{1}{4}$ -inch cove-shaped balsa to the tail boom/wing joint used for the wing fairing, then add filler and sand to final shape.

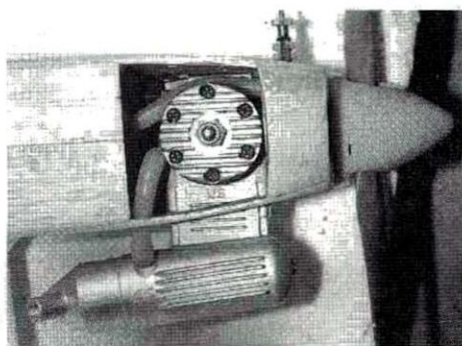
CENTER POD

Building the center fuselage pod is more like building a model boat than a plane. To start, cut formers F-1 through F-7 from

$\frac{1}{8}$ -inch plywood. Slide formers F-5 and F-6 through the opening in the wing's bottom covering and over the two center L ribs, and glue into place. Next, epoxy former F-7 into place, then bundle all the servo wires together and run them forward into the pod. Sheet the rest of the wing's bottom center section with $\frac{1}{16}$ -inch balsa with a notch cut out for the wires to pass through. Cut three $\frac{1}{8} \times \frac{1}{8} \times 18$ -inch-square spruce longerons, and glue them in the slots in former F-7 forward to F-1. Sand the leading edge of the wing flat to accept F-4, and epoxy the former into place. Run two $\frac{1}{8}$ -inch-square balsa stringers from the top of the wing forward through former F-4. Now align and glue into place formers F-3, F-2 and F-1, and sheet the pod with $\frac{1}{16}$ -inch balsa sheet from former F-7 to F-1.

Turn the model over, and glue formers T-1 and T-2 into place, then add the three $\frac{1}{8}$ -inch-square balsa stringers that tie the "T" formers together. Now glue the $\frac{1}{8}$ -inch balsa cockpit floor to the top of the stringers and paint it flat black. The canopy-back former is made from $\frac{1}{8}$ -inch balsa and is glued to the back of the cockpit floor. The aft fuselage stiffener is made from a leftover piece of LE stock that's cut to fit between the top of the canopy-back former and the wing's TE. Now install the antenna tube and then cover formers T-1 and T-2 with $\frac{1}{16}$ -inch balsa sheet.

Trim the bottom of a Sig* WC809 canopy to fit on top of the wing between former T-2 and the canopy-back former. Now add the $\frac{1}{32}$ -inch balsa GS sheet around the canopy to form the rest of the fuselage pod. GS is cut to fit until it blends evenly into the top of the wing. To finish off

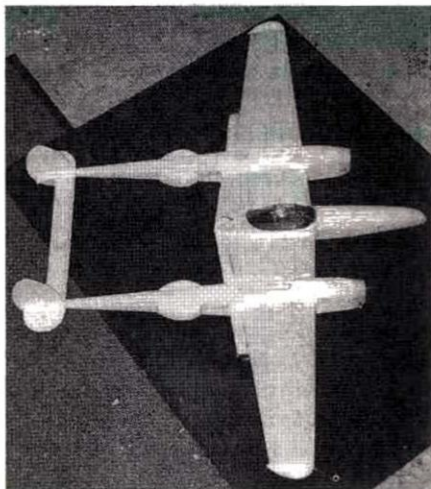


The O.S. Max .15 in place in the boom. Simple installation.

the pod construction, cut out hatch cutters H-1, H-2 and "HF" (hatch floor) from $\frac{1}{8}$ -inch balsa sheet, and glue together as shown to form the removable hatch. Add the $\frac{1}{8}$ -inch balsa stringers and sheet with $\frac{1}{32}$ -inch balsa. Fit the hatch into place and sand to shape. Add the balsa block in front of the hatch as well as the balsa nose block, and sand to shape. I used Goldberg brackets to hold the hatch in place. Go over everything once more, add filler where needed, and sand everything smooth and clean off the dust before covering.

FINISHING

I covered the prototype in MonoKote* and painted the engine cowls with epoxy paint. The prototype was covered with chrome MonoKote, and the second Lightning was covered in olive drab. Both planes took about one-and-a-half rolls of MonoKote to completely cover. To hide the radio on/off switch, I used the center nose gun as the tube for the switch's push/pull wire. Use $\frac{1}{16}$ -inch plywood to make the switch plate, then drill the nose block to accept the switch tube (a coffee stir straw). The other guns are made from $\frac{1}{16}$ -inch wire and $\frac{3}{32}$ -inch brass tubes. Glue the guns in after the plane has been covered. Once everything has been covered, hinge and install all the control surfaces.



The completed P-38 Lightning ready for covering.

FIRST FLIGHT

The day for the first flight was bright and sunny with almost no wind. I called a friend who is the best hand launcher in the state. I think he used to pitch for the Yankees. I fueled up the model and my dad, Arthur Scott, and I got the engines running. As I handed the plane to my launcher, a strange knocking sound could be heard; then I realized it was my knees. Then I punched the throttles, my launcher raised the P-38 above his head, pointed it into the wind and gave it an excellent launch. I was pretty surprised how fast it climbed and flew. I have had lots of time flying a .15-size Wild Thing, and the Lightning felt really comfortable to me. I looped and rolled it and did some high-speed passes. Then I had to land it. I lined up and cut the engines but it floated a lot longer than I had expected, but it was down safely. If you want to give twins a try, why not consider this combat P-38? Once you fly it, I'm sure you'll be struck by Lightning, too!

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.



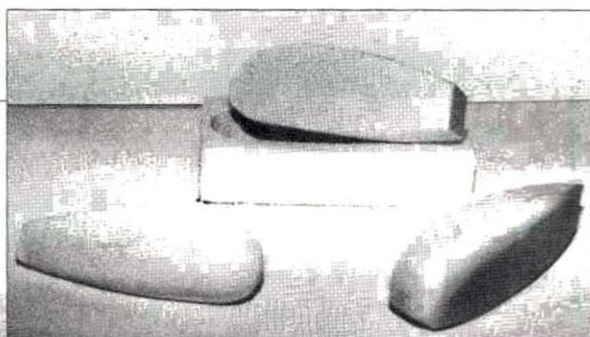
MODEL AIRPLANE NEWS HOW TO Make Fiberglass Wheel Pants

by CHRIS BATCHELLER

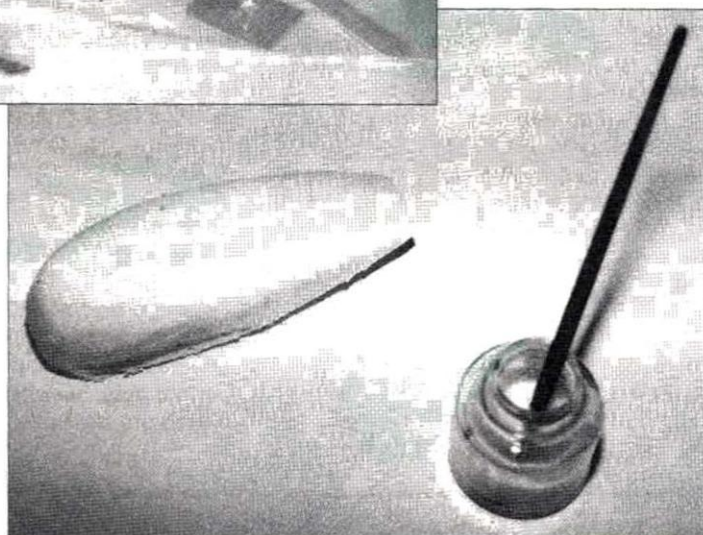
SIMPLY PUT, adding wheel pants to your model is like putting icing on a cake. They're aerodynamic, add scale realism and just plain look good. It couldn't be easier to make fiberglass wheel pants to your exact specifications. Here's how.



1 You'll need spray adhesive, wax paper, sharp scissors, an old hobby knife with a sharp blade, latex gloves, fiberglass resin and hardener (Bondo brand is easy to mix and is available at auto-parts stores), fiberglass cloth, a paint brush, a tongue depressor, a plastic squeegee and a mixing tub. You'll also need white glue, 150-grit sandpaper, a sanding block, an electric sander, a Dremel tool with a cutoff wheel and blue foam.

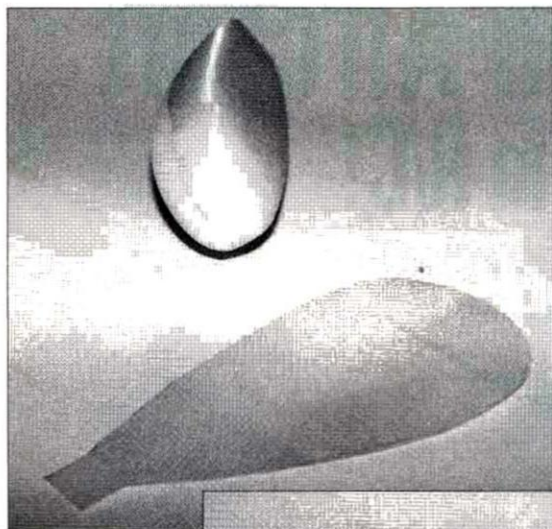


2 If you bought 1- or 3/4-inch-thick foam, spray a light coat of adhesive on each piece, let them sit for five minutes and then join the two pieces together. Cut the wheel-pant shapes out of the foam with a band saw and roughly sand the foam into the desired shape with a palm sander (Black and Decker's Quick-Finish sander works great) using 150-grit paper. Final-sand with a soft sanding block. Any imperfections will be multiplied as you add layers of glass cloth, so sand carefully!



3 After you've finished sanding, seal the foam with two or three coats of white glue. Don't thin the glue down, as this will make the mixture bead up on the foam.

PHOTOS BY CHRIS BATCHELLER

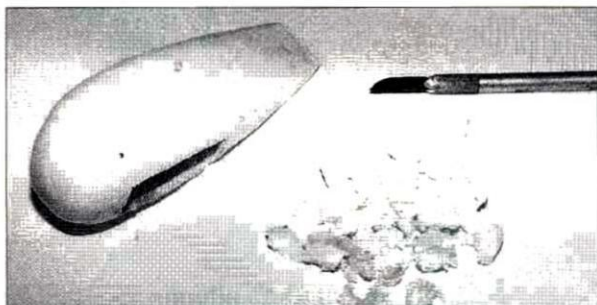


4 Prepare the fiberglass by laying it down on top of a brown paper bag. Apply spray adhesive over the fiberglass, then lay a sheet of wax paper on top of the fiberglass. Let this sit for approximately 10 minutes. Peel the fiberglass off the brown paper bag. You now have self-adhesive fiberglass with edges that won't fray. Cut a piece that's big enough so that the glass will wrap around the curves of the foam mold. Position the fiberglass on the foam and begin to work out all the wrinkles.



5 Mix the resin as suggested by the instructions on the bottle. Work quickly; use the tongue depressor to get the resin onto the wheel pant. When the fiberglass is saturated with resin, smooth out the glass with your fingers (make sure you have the gloves on!). To do this more easily, put a hobby knife in a vise with the blade up and place the wheel pant on the knife where the wheel opening will be. This way, you don't have to hold the pant while you smooth out the glass. Apply a layer of fiberglass to the other side of the mold and continue until you've applied four or five layers. Allow the resin to cure.

6 Spray a base coat of enamel paint on the wheel pants. Again, the hobby knife comes in handy while painting to keep the process hands-free. Be sure to spray several light coats; one heavy coat will run and won't produce good results.



7 Cut out the opening for the wheel using a Dremel tool with a cutoff wheel. Dig the foam out from the inside of the wheel pant. Mount the pants on your airplane using commercially available hardware. Fun flying and happy landings!

About the Author

Chris Batcheller is an aerospace engineering student at Embry-Riddle Aeronautical University. His interests include alternate materials for model construction and persuade scale. He is a licensed full-scale pilot and an aviation photographer.

Fly the Best for Less!

3W-60K

60cc - 3.7ci

Lowest price ever!
\$499.99

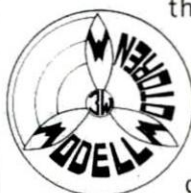


Compare to any other 60cc engine!

- 3 crankshaft bearings
- Electronic auto-advance ignition system
- 5.6 hp — highest in its class
- Long stroke for high torque
- Props: 22x10, 22x12, 24x10
- Light weight 4.4 lbs
- Built-in motor mount
- Easy starting
- One year warranty
- Designed for airplanes — not leafblowers and chainsaws!

3W Modellmotoren —

the world leader in Giant Scale Motors and current TOC Champion. Call for more info on our complete line of motors 24cc to 240cc, single to four cylinders.



Exclusive US Representative for 3W Modellmotoren.

Desert Aircraft

P.O. Box 18038 • Tucson, Arizona 85731

Phone/FAX (520) 722-0607



MODEL
AIRPLANE
NEWS

FIELD & BENCH REVIEW



*An Extra
with a twist!*



House of
Balsa

Extra 300L

by MIKE DEHOYOS

IN THE WORLD of high-performance aerobatic aircraft, Walter Extra's aircraft are well-known. The 300L is a two-seat and slight low-wing version of the 300S made famous by Patty Wagstaff and Phil Knight. The 300L has similar flight characteristics to the 300S and is now brought to the R/C world by the House of Balsa*.

PHOTOS BY WALTER SHIRAS

The balsa in the kit is of excellent quality and free of imperfections. The hardwood parts, including all plywood pieces, are of good quality. The Du-Bro hardware supplied with the kit is very impressive and more than adequate. The instruction manual is clear and to the point with illustrations for every step. The computer-generated plans are easy to follow and very detailed.

TAIL AND WING ASSEMBLY

I like to build the tail feathers first to get them out of the way. I did find after the plane was finished that the vertical fin flexed with every rudder movement, but I solved this by adding struts to the tail.

Note that the wing panels are built upside-down. The wing is standard D-tube construction with a cedar arrow shaft for the leading edge; this is very strong and will take the stress of those wild acrobatic maneuvers.

The ribs have breakaway tabs that facilitate building a wing that is true. After completing the bottom half of the panel, I flipped it over and installed the aileron con-

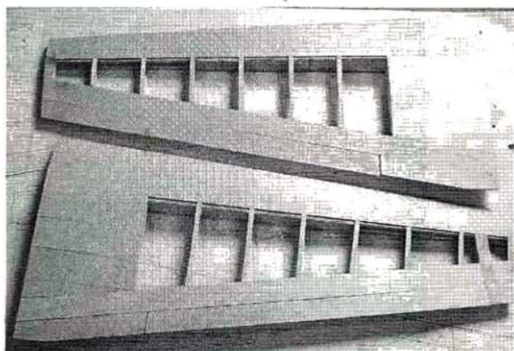
trol horn and the trailing-edge pieces at the root end of the wing panel. I broke off the building tabs and sheeted the wing panel, with the exception of the center section, at the root. The center section has to be left open to epoxy the 1/8-inch ply wing-joint support in place. I built the second wing panel as the first and joined them using 30-minute epoxy. I lightly sanded the wing and set it aside. The rest of the wing will be finished after the main part of the fuselage has been built.

FUSELAGE

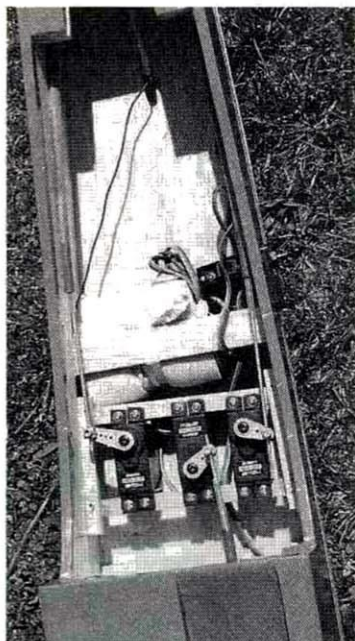
The main fuselage is a box with a turtle deck glued to the aft section of the aircraft. The fuselage sides are assembled of lite-ply and balsa according to the instruction book. I next built the wing-mount former and the wing-mounting plate that will be used later. I assembled the top sheeting of the fuselage and glued the former to it using the orange upright supplied in the kit. (This upright is a handy little tool used in all phases of the building process of this aircraft.)

The fuselage sides, top and bottom were glued together and the firewall was epoxied in place. I trial-fit the wing in the saddle of the fuselage, made any necessary adjustments and then set it aside. Next, I proceeded to build the sub-

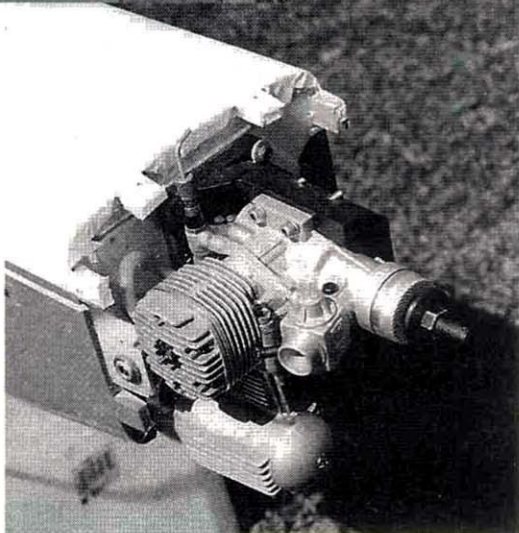
components of the box that mounts the wing on the fuselage. I fit the wing-mounting plate to the fuselage and positioned the wing. Next, I epoxied the wing-mounting plate to the wing, taking care not to permanently fasten it to the fuselage. I temporarily glued the box sides to the wing-mounting plate and attached the rear box former to the wing and the box



The wing panels are built upside-down. The wing is standard D-tube construction with a cedar arrow shaft for the leading edge; this is very strong and will take the stress of those wild acrobatic maneuvers.



Left: there was more than ample room for all the electronics in the radio compartment. I placed the rails for the servos a little lower in the fuselage for clearance to the wing.



Below: an O.S. .46 FX provides more than enough power for vertical performance.

SPECIFICATIONS

Name: Extra 300L

Manufacturer: House of Balsa

Type: 1/5-scale aerobat

Wingspan: 56 in.

Length: 45.5 in.

Wing area: 550 sq. in.

Wing loading: 24.08 oz./sq. ft.

Airfoil: symmetrical

Weight: 5.75 lb.

Radio req'd: 4-channel

Engine req'd: .40 to .46 2-stroke or .50 to .55 4-stroke

Engine used: O.S. .46 FX

Prop used: Master Airscrew 11x5

List price: \$149.95

Features: all balsa and ply construction; full Du-Bro hardware pack; full-size rolled plans; photo illustrated instructions; full set of self-adhesive, fuelproof decals; scale documentation included; 1-ounce bottle of Zap CA.

Comments: I truly enjoyed building this kit. Its highly illustrated manual is clear and to the point, and the high-quality material and impressive Du-Bro hardware made building the Extra 300L a snap.

Hits

- Excellent quality balsa.
- Clear, easy-to-follow instruction manual.
- Uses standard radio gear.
- Optional fiberglass wheel pants and cowl available.

Misses

- Fin needed some reinforcement.

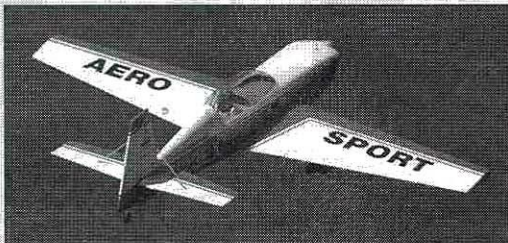
FLIGHT PERFORMANCE

paces. For those with low-wing aerobatic experience, the Extra design handles wind nicely and lives up to the rock-solid performance of its full-scale counterpart.

• Takeoff and landing

The O.S. .46FX, with the 11x5 prop we used, requires slow throttle advance to initiate takeoff, as doing so minimizes the amount of right rudder necessary to maintain the centerline. The tail comes up quickly, though, and the Extra 300L was off our grass field long before I hit full throttle. Our model required a bit of aileron trim and several clicks of down-trim. After flying the plane, I thought the plane flew just a wee bit tail-heavy, though Mike said it was balanced as per the plan.

As with most Extras, you must give them time to bleed off speed prior to landing. I like to drop the throttle quite a bit as I enter the downwind leg. This allows the plane's speed to stabilize such that I can use throttle to control descent while on approach. Using this method, the Extra 300L easily settles onto the runway without any excitement. This plane likes 2-wheel landings, using



It was breezy the day we flew the Extra for the camera, so Mike asked me to do the flying. While we were at it, I put it through its

rudder to control line. Just let the tail settle naturally, and the Extra will reward you with perfect landings.

• Low-speed performance

At low speeds, control authority is good. Stall tests were uneventful. They required a very high angle of attack to induce the stall, and stalls were mild, with recovery requiring little more than leveling the wings. Glide is surprisingly good for an aerobatic plane.

• High-speed performance

The Extra 300L can scoot. Full throttle is too fast for practicing your mini-IMAC routine, but it can be fun to cover a lot of ground in a hurry, and the Extra is up to the challenge. Because of the down-trim we had dialed in, some pitch adjustment was necessary when going from high and low speeds, but a small CG adjustment would solve that problem.

• Aerobatics

This, of course, is where Extras big and small shine, and the Extra 300L is no exception. Tracking through big loops benefited from a bit of right rudder on the up-line, which is typical. Rolls were axial and knife-edge was downright easy. For the camera, I flew repeated partial knife-edge (60 to 70 degrees or so, to put the top of the aircraft in front of the camera) passes the entire length of the runway without thinking hard about it. Just a bit of top rudder was all that was necessary. The only disappointment was that Mike wanted it back at the end of the photo session!

—Larry Marshall

sides. I drilled and marked the landing-gear plate before epoxying it into place. Next, 3/16-inch-square balsa sticks were epoxyed in place for added support. The rest of the box was finished according to the instructions.

I was concerned about how strong the fuselage was, but it proved me wrong. I had a couple of hard landings, and everything came through intact. I finished the rest of the fuselage according to the instructions.

FINISHING UP

I chose to use an O.S.* .46 FX, which provided more than enough power for vertical performance. The 10-ounce fuel tank fit quite nicely in its compartment, along with the battery and foam padding.

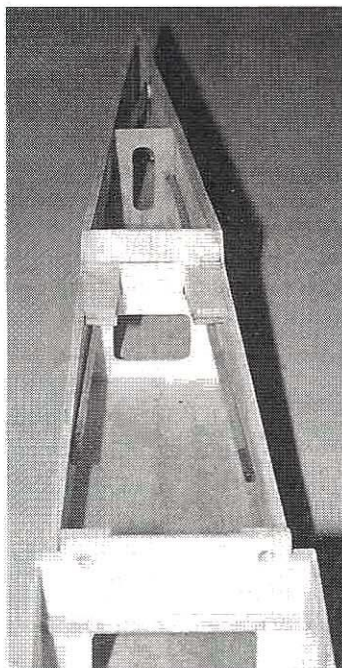
The radio for this project is a JR* 388 with 517 servos that was sitting on a shelf just waiting for a plane like this. There was more than ample room for all the electronics in

the radio compartment. I placed the rails for the servos a little lower in the fuselage for clearance to the wing.

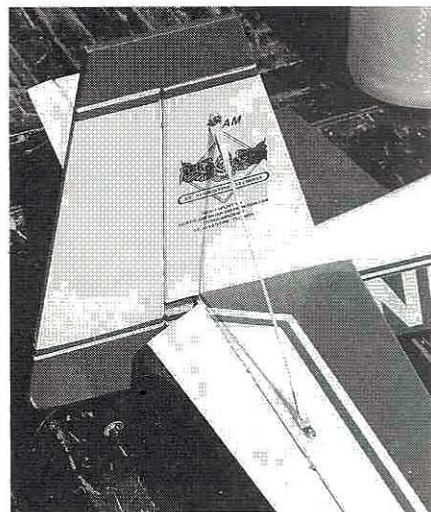
The Extra 300L comes with all the necessary material to construct a wooden cowl and wheel pants for those builders who would rather cover with their favorite material than paint plastic or fiberglass. An optional fiberglass cowl and pants are available from House of Balsa.

After placing the battery in the fuel-tank compartment and the servos and receiver in the location described in the manual, I did not have to do a thing; the Extra balanced perfectly first time around.

After a final sanding with 100- to 220-grit paper and a light coat of Balsarite*, the model was ready for its final skin. I used 21st Century* fabric and Pro-stripe standard automotive pinstripe, which is fuelproof and durable. Paint for this project



The main fuselage is a box with a turtle deck glued to the aft section of the aircraft.



Bracing on the tail feathers helps hold the Extra 300L together during wild aerobatics!

is also by 21st Century and matches the covering perfectly.

OVERVIEW

I enjoyed building this kit. Its highly illustrated manual is clear and to the point, and the high-quality material and impressive Du-Bro hardware made building the Extra 300L a snap. The optional fiberglass cowl and wheel pants are an extra plus. In flight, the Extra 300L is a rocket on rails and should give me many hours of enjoyment.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142. ★



HIROBO Shuttle "Z"

by PHYLLIS BELL

HIROBO'S* SHUTTLE SERIES has allowed new pilots to try their hands at the challenge of flying helicopters since August '85. Over the past 12 years, the affordability and reliability of these machines have boosted the popularity of helis among pilots of all skill levels. The Shuttles are also available ready to fly! The Shuttle is offered in three styles: the low-cost "Z" model is great for beginners; the mid-priced "ZX" is the newest of the series; and the .30-size "ZXX" has all the bells and whistles included. Over the years, many experienced builders have written reviews of the Shuttle models; they've said that the Shuttles are simple to put together. Because I'm a beginner, I decided to build the "Z" ARF model and put it to the test!

THE KIT

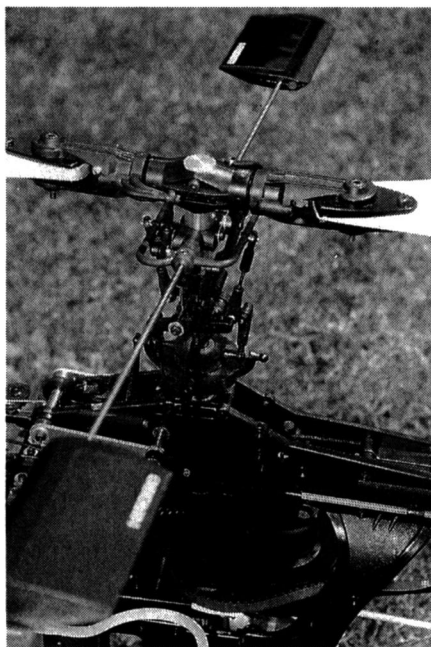
After taking a couple of minutes to admire the great box art, I slid the kit out, popped off the top and viewed the contents. The main frame was complete with an Enya .35 engine, fuel tank, servo tray, main rotor head, linkages and bellcranks already installed. There were also several bags of hardware, a tail boom with tail-rotor assembly, an assembled canopy and a really great-looking decal sheet. Also included with the instruction manual were some safety instructions, maintenance notes, a pitch gauge and a gauge to help align the flybar paddles. As I glanced at my new endeavor, I thought, "Yes! I should be able to build this before my husband gets his hands on it!" (He's one of those experienced builders). I sat back in my chair, put my feet up on the workbench and began to review the manual.

ASSEMBLY

The manual was written to use with all the Shuttle models. While I found it to be descriptive, I also found that its layout was a bit confusing. I didn't like the Japanese captions with the English translations or thumbing through the pages to figure out which sections of text applied to which assembly. After a few minutes, I

See what all the fun is about!

located Step 23, "Landing Gear Assembly," and decided to start here. I installed the skid feet to the main frame and passed the skid pipes through the holes in the skids. The skids are secured with setscrews and a few drops of CA. Now my helicopter was freestanding. I checked the hardware and subassemblies with the manual. I located and marked



The Hirobo Shuttle "Z" rotor head comes preassembled.

the steps that needed to be completed while I studied the assembled helicopter components. I also checked to make sure that all fittings were tight and nothing had come loose during shipping.

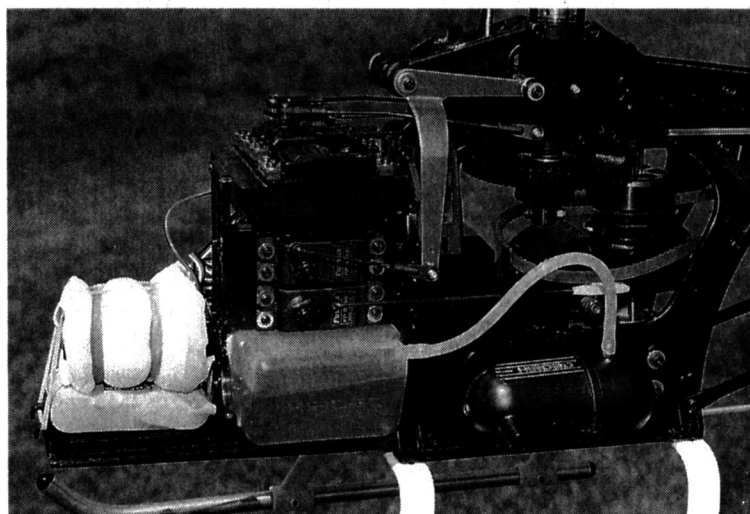
I changed the direction of the muffler outlet as recommended by loosening the bolt that holds both ends of the muffler together and rotating the outlet away from the helicopter (this prevents the exhaust from blowing dirt and dust up into the mechanics). With this easily accomplished, I moved on to the drive-pulley/tail-boom assembly. I was careful to check the rotation of the timing belt. As the main rotor is turned clockwise, the tail rotor blades should also turn clockwise. The timing-belt tension should be adjusted as indicated. Hey, this was really starting to look like something! I was psyched!

Now on to the stabilizer/tail-boom-brace assembly. The "Z" doesn't come

with a tail-boom brace assembly, but I opted for it. I like the way it looks and think that it adds strength to the tail boom. With the horizontal stabilizer and tail-boom braces in place, it was time to check the lengths of the mixing arms, elevator, aileron, stabilizer control and collective pitch pushrods for the main-rotor head along with the throttle pushrod—really easy! The provided pushrods are the correct length, and Hirobo provides a true-to-scale diagram to check them with. Way to go, Hirobo!

RADIO INSTALLATION

Well, now it was time to install the radio equipment. I'm using a Futaba* 6XH, a great 6-channel computer radio for the helicopter novice. The computer functions are easy to understand, and it has more than enough features to enable novices to get the most out of their helicopters. After carefully checking the rotation direction of the five servos, I installed them using the screws and washers provided with the kit. I attached the Futaba 154 gyro behind the servo tray with two layers of Ace R/C* double-sided tape, making sure the gyro case didn't touch the main frame or any other parts. I wrapped the receiver in foam and placed it in front of the servo tray along with the battery pack using rubber bands. I then installed the switches to the main frame. I connected all the plugs to the receiver and once again checked the rotation of the servos. So far, I have to say that those "experienced builders" haven't been wrong; things have gone together pretty easily! Let's see; all that's left is to



The radio installation is simple and neat with the fuel tank, servo tray and engine already installed.

SPECIFICATIONS

Model: Shuttle Z ARF

Type: helicopter (collective pitch)

Manufacturer: Hirobo

Distributor: Altech Marketing

Rotor diameter: 1,100mm (43.9 in.)

Length: 1,403mm (55 in.)

Engine used: Eyna .35 (included)

Radio req'd: 5- to 6-channel heli radio

Radio used: Futaba 6XH

Gyro used: Futaba 154

Retail price: \$399.95

Features: ARF format; comprehensive manual; set-up gauges supplied; easily upgradeable to ZXX specs.

Comments: The Shuttle Z ARF is an easy-to-build heli that is a solid performer for both novice and expert pilots.

Hits

- Quick and easy to build.
- Simple mechanical layout.
- Great performance.
- Looks great with supplied decals.
- Replacement parts and optional parts readily available.

Misses

- Instruction manual could be easier to follow.

hook the linkages up to the servos and assemble the main blades. (Can I finish before my husband tries to help?)

When hooking up the aileron and the elevator pushrods, I made sure that the servos were centered and the bellcranks and swashplate were level. This helped to ensure that the controls were centered as

HIROBO SHUTTLE "Z"

closely as possible mechanically and allowed me to fine-tune using the radio. Next, using the kit-supplied pitch gauge, I set the collective pitch range. It took a few minutes for me to understand this step, but in the end, I was able to complete it without much effort. Again, I carefully checked the collective stick movement, making sure that the maximum and



Phyllis Bell poses proudly with the Hirobo Shuttle "Z"—her first helicopter.

minimum throws complied with the instruction manual. I continued connecting the throttle and tail-rotor linkages using the same techniques as above. Now it was time to ensure that the gyro direction was correct. I turned the gyro on and moved

FLIGHT PERFORMANCE

instruction manual. One other thing he did was to check the CG, as this is very important for any aircraft. The CG was slightly ahead of the main mast, which was OK. We were now ready to start the flight tests. The first test hops confirmed that "doing it by the book" was the way to go, as only minor trim corrections were needed. Blade tracking was also very close to perfect and the head speed was at a comfortable rpm (those experienced guys are still right). When I finally wrestled the transmitter away from him, I was in for a treat. I was nervous at first with my new heli, but I knew that it was properly trimmed. This helped to calm me. I found the Shuttle to be very stable and comfortable in my novice hands. It was responsive, but not twitchy, as I've heard that smaller helis can be. This really boosted my confidence. I can't comment on its forward flight characteristics or its aerobatic abilities, as I'm still learning to hover. However, I'm sure I'll get there soon.

I took my own advice and asked my husband to check the Shuttle over before its first flights. He also did those first important trim flights for me. He found the heli to be assembled correctly. All fasteners were tight and the setup was per the



the nose of the helicopter to the right; the gyro instructed the servo to give left. Cool; that's working correctly!

Hirobo provides covered, prebuilt blades with this kit. All that was needed to complete these was to re-shrink the covering and balance the blades as recommended in the manual. Hirobo provides a nice narrative (located with the safety and maintenance notes) regarding the main-blade

assembly. After balancing and attaching the blades to the rotor head, I aligned the flybar paddles using the handy gauge provided with the kit. To make starting the engine easier, I installed a remote head lock from Model Products Corp.* to the right side frame (a suggestion from my husband, I knew he couldn't resist!). All that was left to do was to apply the graphics. After this was done, I once again sat back in my chair, put my feet up on the workbench and admired my masterpiece. The helicopter looked awesome with the graphics in place!

There is still one very critical step left. Even though the instruction manual provides some great beginner techniques, I strongly suggest that you seek out the help of an experienced heli pilot. Having your mentor confirm your setup and check over the machine is a great confidence booster, and having an experienced heli pilot perform the initial flight tests and properly trim the helicopter will help to ensure your success.

SUMMARY

I found building the Shuttle to be an easy, pleasant experience (those experienced guys were right!). After getting used to the manual, it took me four 1- to 1½-hour sessions to get the heli ready for its first flight. Having built and hovered this heli, I now have a greater appreciation of the heli end of the hobby; it's a lot of fun! The Hirobo Shuttle "Z" ARF is a great way for beginners to experience the challenges of helicopter flight.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.

FUTABA 6XH

The Futaba 6XH is Futaba's newest entry into the beginner computer radio market. It has some of the advantages of the higher priced computer radios without the higher price tag. The 6XH instruction manual was written by Don Edberg and is not a translation. The manual is easy to understand and is illustrated with diagrams. Features of the 6XH include: 3-model memory; throw adjustments on all channels; dual rates; servo reversing; sub trims; trim memory; high idle; throttle hold; three-point pitch curve; three-point throttle curve; hovering trim; revolution mix; and rudder offset.

Not having set up a heli before, I found that using a computer radio with the heli manual was an easy task. The computer functions allowed me to dial in the correct direction of servo movement and the correct amount of throws. My thoughts after using the 6XH in my Shuttle are: the 6XH is an easy-to-use computer radio for the beginner. While it doesn't have all the bells and whistles of more complicated radios (nor does it claim to), it is priced far below them. The 6XH will take you through learning to hover, forward flight and basic aerobatics. If you're thinking of getting into R/C helicopters, this system is hard to beat.



SR **Late breaking news...**

At Last! A radio system for the Electric and Soaring R/C flyer at an affordable price!

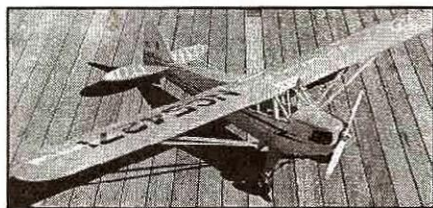
We've teamed up with Hitec RCD to bring you a micro radio system that only includes the items you really need. Not those you don't. The system includes the Flash 5 transmitter, Micro 535 five channel receiver, two HS-80 Micro servos with accessories, a system charger, switch harness and aileron extension. You won't get a full size receiver, full size servos or a full size receiver battery pack. For the first time, the box will be empty when you install this new radio system in your new Electric aircraft or sailplane.

The features include:

- 2 Model Memory • Model Copy Function • Rudder/Aileron, Elevon, and V-Tail Mixing • Dual Rate Ailerons and Elevator • Digital Electronic Trims • End Point Adjustment • Total Volume Control • Servo reversing • Exponential Rates • Trim Memory and Reset • Timer and Low Battery Alarm • Trainer Function

The price? That's the best part, only 199.95!

Hangar 9 Cub Power System



Volume E-14 of *Electric Flight Techniques* deals with the conversion of



the Hangar 9, Giant Scale Cub from gas to Electric power. In response to the



many requests we've received, we have

put together a complete *prop nut* to battery pack power system for the Giant Scale Hangar 9 Cub. It consists of a scale like prop nut, Master Airscrew 13x8 Electric prop, AstroFlight geared 40 motor, Aero-Vee motor mount, AstroFlight 204D speed control, custom wiring harness with Sermos Fuse Holder and AstroFlight connectors, and a 21 cell, SR 1800 Max Series battery pack with connector. We have a very special price for the system so give us a call if you're interested in building a Giant Scale Cub or similar aircraft.

SR Techniques Volumes Added to the Archive!

In April, **Volume R-4** was added to the *R/C Techniques* archive. This volume covers the conversion of a simple multimeter, that you probably already have, into the most useful tool in your shop. Plus, how to make the best ESV in the world for only a few dollars in parts. Volume R-4 is only \$2 plus 50 cents postage. Here's what's included:

- How to:
 - Check charging current
 - Check cyclor's discharge current
 - Check cyclor's cutoff voltage
 - Check servo current draw
 - Check receiver current draw
 - Check for binding in your hinges
 - Check for bad servos
 - Check transmitter's current draw
 - Check for bad cells in a pack
- Make your own ESV
- How to strain relieve wires when using Sermos connectors
- A complete parts list for making the test harness and ESV

In May, **Volume E-15** was added to the *Electric Flight Techniques* archive. If you've ever wondered why some people get longer flight times from their Electric ships, Volume E-15 will give you the answer. And, you'll learn how to trim your aircraft and position its CG for the longest possible flight times. It's only \$2 plus 50 cents postage. Here's what's included:

- What kind of speed control can increase your flight times by as much as 50%?

- How do you trim a single channel aircraft?
- Why would you use down thrust?
- Why is trimming an Electric aircraft very different from trimming a gas aircraft?
- Why shouldn't you use down thrust in an Electric aircraft?
- How should an Electric aircraft be trimmed for the longest possible flight times?
- How should you shim the wing or stabilizer to achieve a neutral elevator setting?
- What's the best way to know that your battery pack is almost out of power?
- What is CG?
- Why is it important?
- What are the two aspects of CG?
- Is there an easy way to check all aspects of CG at the same time?
- What happens if the CG is too far forward?
- What happens if the CG is too far aft?
- What are the best ways to change the CG?
- How can you test your aircraft to determine where the CG should really be?

Electric Flight Symposium Videos Are Finally Available!

Each year, prior to the world famous KRC Electric Fly, SR presents a day long Electric Flight Symposium featuring many of the foremost experts in the field of Electric powered model aircraft. The 1996 Symposium was again a standout because of the many and varied subjects which were presented. We're glad to announce that the program was professionally video taped so that if you weren't able to attend, you won't miss the information presented. There are now two video tapes of the Symposium available, each two hours in length. The videos are \$19.95 each plus \$3.50 for postage and handling. If you'd like more information, just give us a call. To order, call or write SR Batteries, Box 287, Bellport, NY 11713. Fax: 516-286-0901, Phone: 516-286-0079, or Email: 74167.751@compuserve.com

— ADVERTISEMENT —



Scratch-Builders' **CORNER**

by **GEORGE WILSON JR.**

A PERFECT BALANCE

THIS COLUMN on balancing is a companion to that of July '97 on alignment and is based on Mario Borgatti's presentation given for the Discover Flying Radio Control Club. With the well-put premise that "A model that is balanced and aligned

that the horizontal reference line is level and parallel to your work surface.

These tools can be augmented by blocks and shims that may be necessary to level your building surface. Incidentally, a set of square blocks should be part of every



Three types of levels that are useful in balancing models: the plastic line and surface levels are about \$2 each at a hardware store, and a smaller version of the Sears dial level is available for less than \$10.

as the plan indicates will fly as the original did," Mario's talk was aimed at both kit builders and scratch-builders. Mario emphasized that alignment and balancing can be done with inexpensive tools.

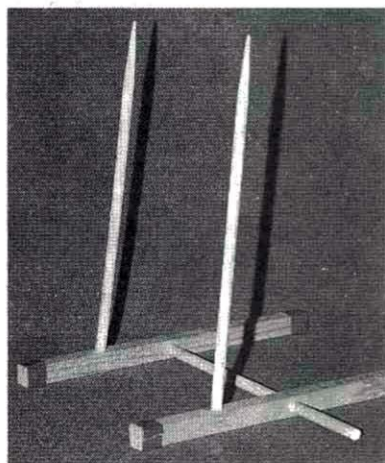
NECESSARY TOOLS

The necessary tools for balancing a model are relatively inexpensive. You can buy plastic-bubble line and surface levels at a local hardware store for about \$2. To ensure accuracy, check them against a good carpenter's level, and then sand or file them to make them agree. You can also buy a neat 360-degree dial level for less than \$10.

Great Planes*, Ace R/C* and Carl Goldberg Models* carry balancing stands, or you can build your own. This tool makes adjusting the model's balance point a one-man job and also doubles as an aid in setting the wing's dihedral angle.

Perhaps the most important tool is the simplest: a "level stand" allows you to support the aft end of the fuselage so

builder's tool collection. Cut them carefully on a table saw. I suggest that you have two $\frac{3}{4} \times 1\frac{1}{2} \times 12$ -inch blocks, two $1\frac{1}{2} \times 1\frac{1}{2} \times 12$ -inch blocks, two $\frac{3}{4} \times \frac{3}{4} \times 12$ -inch blocks, one $1\frac{1}{2} \times 1\frac{1}{2} \times 3$ -inch block and one $\frac{3}{4} \times \frac{3}{4} \times 3$ -inch block. The exact dimensions are not important, but when two are called for, they should be alike; cut two from the same length of



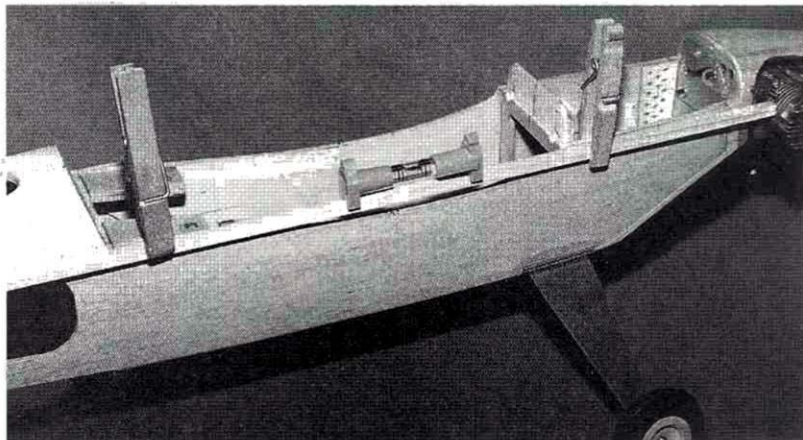
A CG stand like the one shown here makes fore/aft balancing a one-man job.

wood. A coat of sealer (shellac, dope, etc.) will help preserve them.

If you don't have one, buy a long 3-foot straightedge, or "do it yourself" with a length of aluminum or Plexiglas. Whether you build from scratch or using kits, you'll find many uses for a straightedge.

REFERENCE LINE AND BALANCE POINTS

The fuselage's horizontal reference line and its top and bottom centerlines (CL) should be marked. It's helpful if you mark the bulkhead CLs before you install them; however, the straight line between the firewall's center and the tail post center is the true CL. You may notice a bow when you compare the CL with the bulkhead CLs, but it should be small enough to be ignored. In any case, when the fin is mounted, it should be parallel to the CL.



Mario shows the horizontal reference line. This line should be horizontal during level flight and must be set horizontal during the balancing process.

PHOTOS BY RICHARD MACDONALD

Scratch-Builders' CORNER

Transfer the horizontal reference line from the plan to one fuselage side. Avoid denting the wood by using a very soft pencil to draw the line, or mark several spots and then apply masking tape to show the line.

Mark the proper balance point (from the plan) on the bottom of the fuselage (both sides) and wingtips and on the top and bottom of the wing center. Draw lines from the center marks on the wing outward (perpendicular to the wing's CL). You'll use these later to position the balance stand and to check the wing's position with respect to the fuselage.

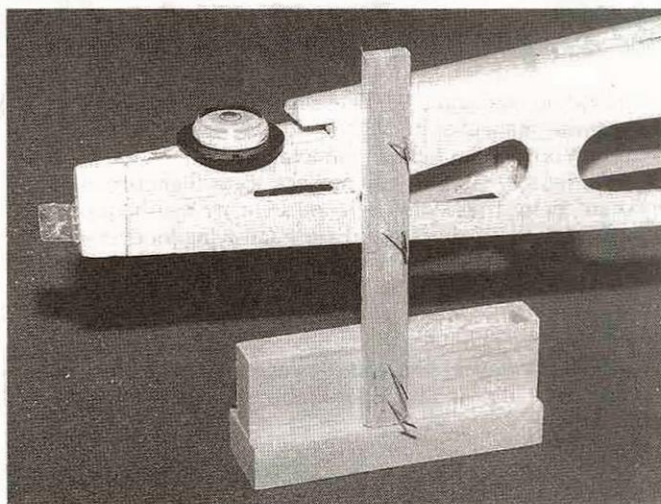
BALANCE

Fore and aft balance is the most important balance adjustment. If the model balances too far aft, it will be difficult—if not impossible—to control. If it balances too far forward, it will be "over-stable" and require large amounts of control to maneuver it. Trial-balance the model early in the

building process when you can easily move equipment such as batteries and servos—even the engine/motor or wing positions. Balancing the model with extra weight may be necessary, but it should be avoided if possible.

The first step in fore/aft balancing is to level your work surface by placing a level on it and shimming under it as necessary. Level it twice at right angles to each other, or use a round level, which will show levelness in all directions.

Set the model with its flying surfaces, R/C equipment, engine, landing gear, etc. temporarily in place on the leveled work surface. Mount a level on the fuselage parallel to the reference



The level stand shown here is a simple tool used to set the horizontal reference line. Sometimes, the simple tools are the best; this one sure beats a stack of blocks!

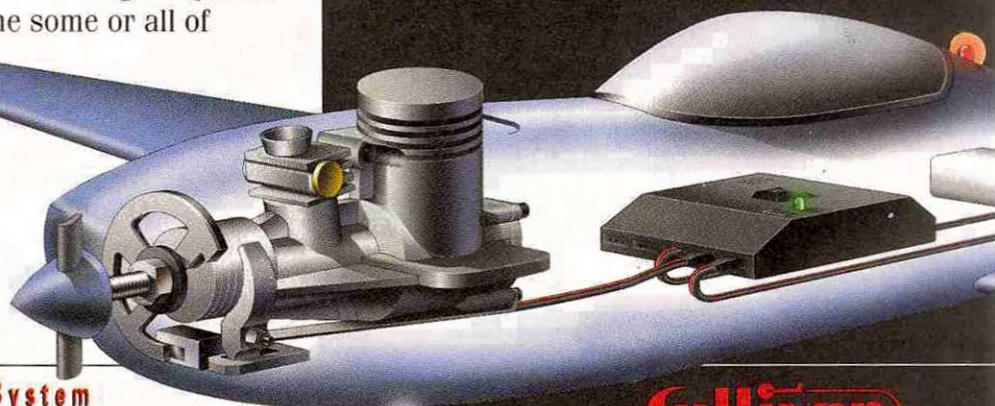
line. Tape it on, or find a spot to set it that is parallel to the reference line. Then pin the aft end of the fuselage to the "level stand" when the reference line is horizontal (level). This is the

(Continued on page 81.)

With Genesys you can: ☐ Recharge your receiver batteries and keep them fully charged while you operate your model. ☐ Recharge a separate battery pack. ☐ Supply the current needed to run your on board receiver and servos when your engine is running above idle. ☐ Operate such optional Genesys accessories as navigation lights, strobe lights, rotating beacons and radio operated on/off light switch without draining your flight pack batteries or using a separate battery pack. ☐ Combine some or all of these options in any configuration you choose.

Genesys

In Flight Power System



Introducing Genesys.
The Electric Power System
That Charges Your Receiver
Battery, Operates Servos,
And Runs Accessory
Lighting While You Fly.

Sullivan
PRODUCTS

P.O. Box 5166, Baltimore, MD 21224 U.S.A.

Scratch-Builders' CORNER

(Continued from page 79.)

attitude that the model will be in when it is flying "straight and level." The level stand will be used later when the flying surfaces are set to their proper angles.

Lift the model with your fingers under the balance lines marked on the bottom of the wing. With a bit of luck, the reference line will be close to horizontal. To fine-tune the balance, set the model on a "balance stand" with its tips as far from the model's CL as practical and on or near the balance line. Move the model fore and aft until it balances. Shift or add weight as necessary to achieve balance at the balance marks. After the model has been covered and finished, a final fore/aft balance check should be made and the balance adjusted if necessary.

Left/right balance is relatively easy to obtain. It corrects for equipment that is off-center (typically, the muffler). Balance the model on the propeller shaft and the tail post, adding weight as necessary at the wingtips.

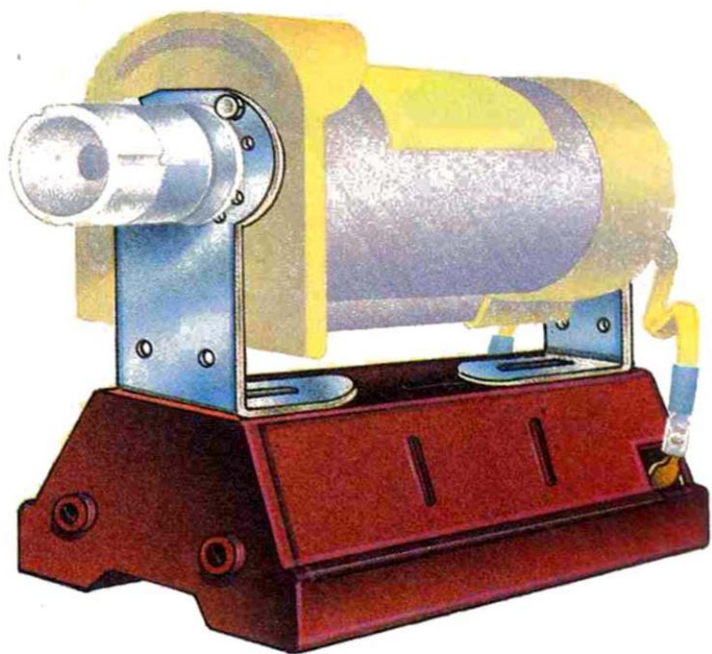
If balance weight is needed, always add it as far as possible from the model's center (CG), where it will have maximum leverage and the smallest amount of weight will be required. A heavy propeller nut (available from Harry Higley*) or spinner weights (available from Great Planes) are useful if nose weight is needed. If more nose weight is required, place it as near to the nose as possible. Lead flashing from a building supply house can be shaped and is easy to cut with scissors. Attach it with screws or double-sided tape.

CONCLUSION

The foregoing should not be interpreted to mean that a model must be micro-balanced to fly well. A 1/4 inch of tolerance in the balance point of a .40-size model is allowable and probably won't be noticeable. After the model has been test-flown by a competent pilot and flight trims have been made, you can move the balance point forward or backward to make the model more stable or more responsive to the controls. Do this in small steps. Your first experience in trying to control a tail-heavy model will teach you to be very careful.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.

Our New Battery Pack Is A Real Turn-On.



For cordless starter power, there's never been anything like the new Sullivan PowerPac. For starters, the PowerPac (#640) packs more power — over 20% more — than any other leading battery pack. And if you're looking for a battery pack that's easy to use, our PowerPac couldn't be better. It works with a simple (no solder) insertion of 12 Sub-C NiCad batteries, (batteries not included), installs easily on Sullivan Hi-Tork or Dynatron starters and is adaptable to most other starters. Best of all, the Sullivan PowerPac is so convenient, you'll want to use it every time you fly. So get more power right from the start. Pick up the new Sullivan PowerPac. It'll turn you on every time you take off.

Sullivan
PRODUCTS

P.O. Box 5166, Baltimore, MD 21224

Getting Better Ideas Off The Ground.

Fuel Level Sensor System

- Quality Wired Connectors
- Gold Plated Fuel Probe Tip
- High Intensity Strobe Light
- Universal Power Connector
- Sealed Electronics

\$69.95

To Order or
For Information
Call: Aerial Dynamics
(818) 500-8802

P.O. Box 5535, Glendale Ca., 91221
Full order and information at our WEB site
<http://home.earthlink.net/~aerialdyn>

Aerial Dynamics

Model FS-2

4.8 Volts

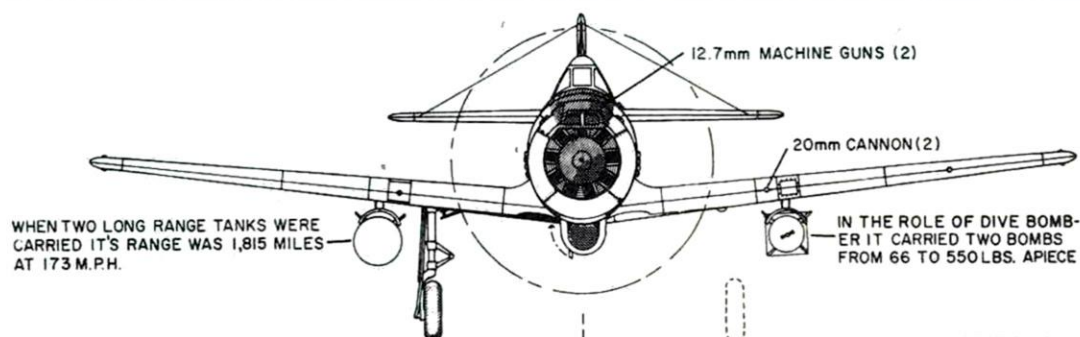
Fuel Level Sensor
Electronics

Actual Size

Planes Worth Modeling

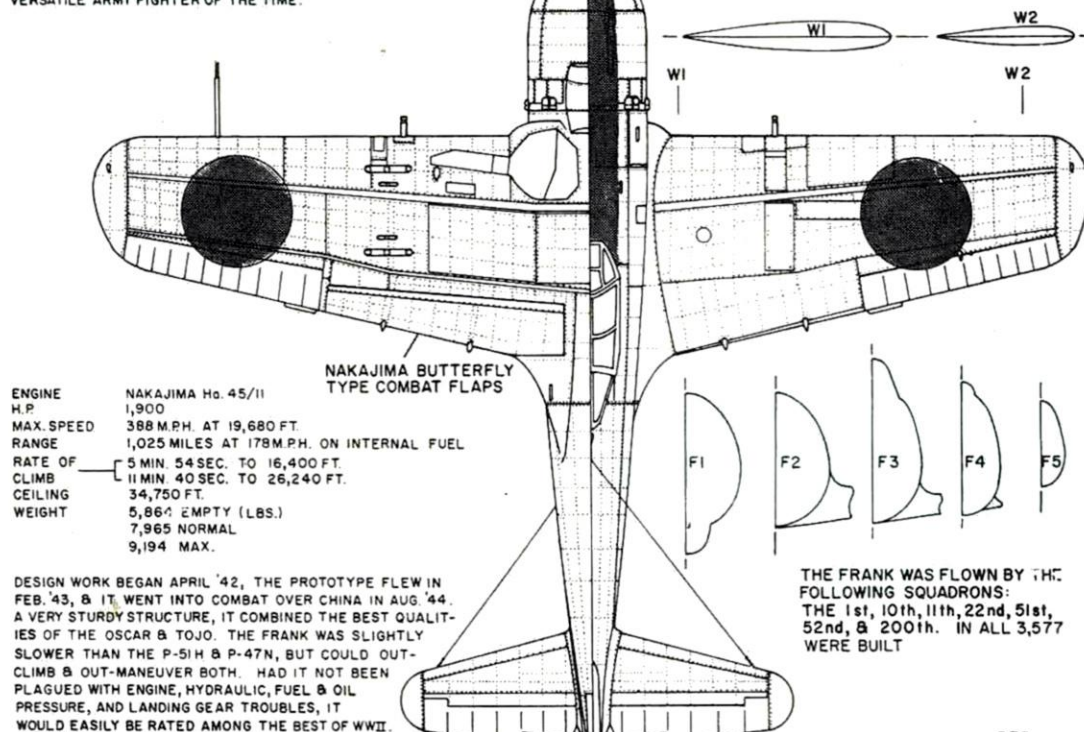
3-View Documentation
for Scale Modelers

Nakajima Ki-84 Frank



A NUMBER OF FRANKS WERE CONSTRUCTED WITH WOODEN PANELS IN ORDER TO SAVE WEIGHT & MATERIAL WITH NO SUCCESS. IT'S RUGGEDNESS, HOWEVER, MADE IT THE MOST VERSATILE ARMY FIGHTER OF THE TIME.

WING CENTER SECTION IS AN INTEGRAL PART OF THE FUSELAGE



SPECIFICATIONS

Wingspan
36 ft., 10⁷/₁₆ in.

Length
32 ft., 6⁹/₁₆ in.

Wing area
226.04 sq. ft.

Weight (gross)
7,955 lb.

First used in combat in March 1944, the Nakajima Ki-84 Hayata (Gale) was the best all-round fighter used by the Japanese. Code-named "Frank" by the Allies, the prototype first flew in April 1943, powered by an Ha-45/11 radial engine producing 1,800hp. Though not as fast as the latest U.S. P-51s or P-47s, it could outmaneuver and out-climb them. Franks first went into combat against the U.S. 14th Air Force (the former Flying Tigers) in China, and soon after, fighter groups operating out of the Philippines were equipped with Franks. Though improved versions of the Frank were quick to follow, Allied bombing seriously hampered its production.



Golden **AGE** OF R/C

by HAL deBOLT

YOUR OLD-TIME R/C PLACE!

IT'S CATCH-UP TIME again on your reports of interesting OT R/C adventures. Your input is always welcome! I'll start with something that strikes close to home.

In past editions, I've discussed the Interceptor—my cherished pattern design. I thought I should end that discussion by explaining the last of the breed, the Mk VII. (Yes, the design went through seven major modifications!) The Mk VII was created when I retreated from pattern to racing—long after the 'Ceptor's glory days. It does seem that each time I

Curiosity and the desire to add pattern to my Sunday flying led me to see if there couldn't be another approach to pattern competition using the noted powerplant.

The result was the Mk VII Interceptor, which I called the "Solution." A detailed account of it was presented in the July '78 *Model Aviation*. How good did I find the Solution? After every flying session, I wished I was still in pattern competition! Here's a thought: what a combo the Solution and the current Rossi .40 would make!

From Sheboygan, WI, comes a nice letter by Don Waterhouse asking for advice and

including fine photos of local activity. It appears they have great times! He included a photo of the Steve Wittman exhibit in the EAA Museum. This rang a bell with me as there, in real life, was Steve's last version of the



Hal deBolt with Playboy version of the LW Pursuit used in first World Champs (1960).

Tailwind, W-10. This is the one that Steve so obligingly provided me the data on for my 1/3-scale T-Wind.

Then to top it off, hanging above the exhibit is the Stitts Playboy. For my entry in the first World Championships, I updated and modified the Live Wire (LW) Pursuit, patterning its appearance after this Playboy! It's strange how happenstance brings back fond memories!

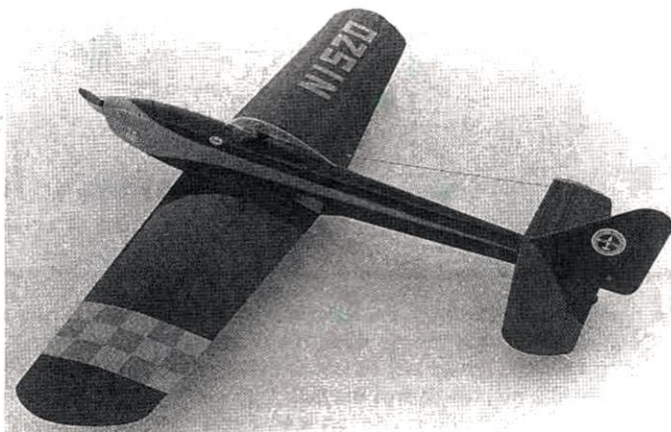
To complete this discourse, there is a fine letter and photo from Jack McAlister of Niceville, FL, with another unusual tale. It seems in 1964, while stationed in Japan, Jack saw fit to purchase an LW Acrobat kit. The war took him away from R/C, but his model stuff did get back to the States, including the kit. Now, some 30 years later, he finally found time to assemble his Acrobat. He comments that the claimed "24-hour assembly" turned into three months of "messaging about," but otherwise,



Hal deBolt's 1/3-scale Wittman final W-10 "Tailwind."

switch phases in modeling, I learn something new that's generally applicable to other types of R/C aircraft.

As an OT'er, I still watched pattern trends closely and was perturbed to see the designs becoming smaller, heavier and more complex. To adjust for this, you had use more and more powerful engines, which effectively had the cat chasing its tail! I thought there should be a better way. In my Formula I effort, I had evaluated K&B's new front rotor 9000 engine. This amazing .40-size engine provided more power than most .60s. I also found that Mac's Products offered a sleek, small muffler for the K&B that could easily be hidden in a cowl. Also, the rules in pattern had changed, and two-wheel gears were in vogue.



Hal deBolt's .40-powered Solution was the last of the Interceptors.

MERRIE OLE BRITAIN

A long letter from Bob Forrest of Scotland tells us that those of us on this side of the pond were not alone with early R/C tribulations. He and friends, as active control-line and free-flight'ers, looked at R/C with relish, but their hobby budgets were empty. They finally managed a single-channel model built from a magazine article and were on their way. Without a car, a flying session meant lugging equipment and plane on a tram to the ferry and then onto a bus, which still left a mile walk to the field. What dedication!

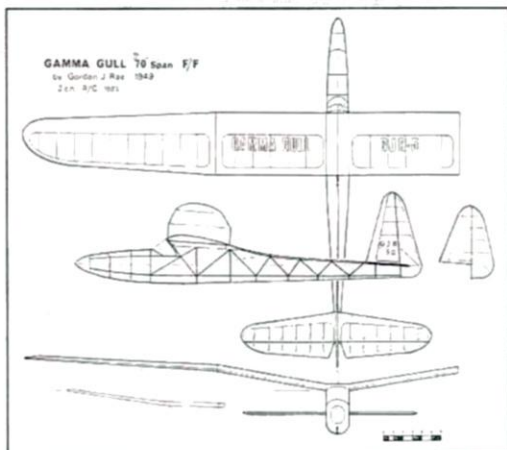
Along the way, Bob built the fine Milt Boone Charger by scaling up Zaic 3-views. The design proved fine, so he continued with several more sizes. My OT cohort Chris Olsen was apparently an inspiration to him and many others. Early English multi-control models were troublesome, but they were able to get into aerobatics with the Smog and Astro Hogs.

Of interest: Bob recalls a Northfield-Ross muffler that separated the oil from the exhaust, thus no gook! Wonder is, why not now? Still active, Bob takes pleasure in OT R/Cs such as the Taurus and Buzzard Bombshell.

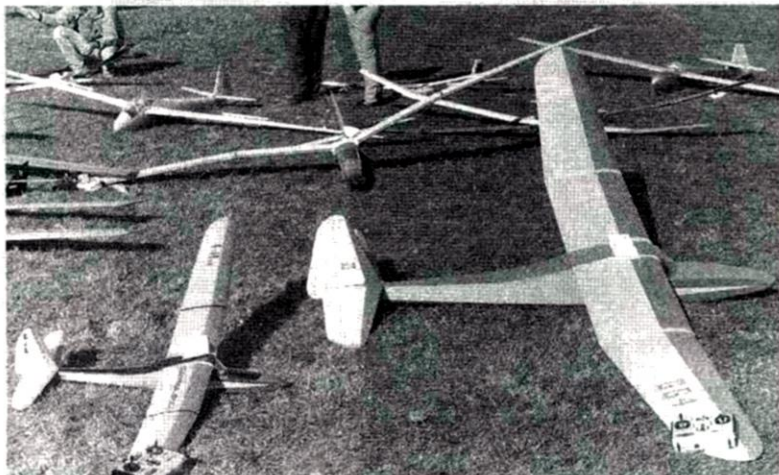
For R/C glider fans, Gordon "Gamma" Rae of Malvern, England, checks in again. Back in 1949, Gordon scaled up his Baby Gull to a competitive size for an RAF Championships. It was an immediate winner and continued to be so. This Gamma Gull became a *Model Airplane News* article. Gordon's Gulls were successful for many others; he attributes this success to its ancient '30s-era Gottingen 436 airfoil, which provided exceptional launch height and wind penetration.

Success often leads to more, as it did with Gordon's giant 12-foot version of the Gull (called "Big Gee"), which still does well in Unlimited. Note that experiments, such as using gull and polyhedral wings, were tried, but little difference was seen. The latest of the Gulls—a 100-inch version—was created in 1990.

So it would appear, if you desire a successful OT glider, one of Gamma's Gulls is not only pretty but probably a fine choice!



This Gamma Gull 3-view indicates its classic appearance.



A gathering of R/C Gamma Gull gliders in England (left to right): the *Model Airplane News* Gamma Gull, the 12-foot Big Gee Gull and the 12-foot polyhedral Gull.

the unusual model raises eyebrows at his field. Jack says that the Acrobat's performance is just great. I might add that the Acrobat is an excellent example of the "fly on the wing" design philosophy. With its 5 1/2-pound



Jack McAlister's LW Acrobat was in kit form for over 30 years!

weight and 1,100 square inches of wing area, it does well with a .40-size engine.

Regarding some AMA business, I had a most flattering letter from Richard Kennison, registrar at the AMA museum. The museum is anxious to obtain exhibit material that predates the AMA, such as the Junior Birdmen, Jimmy Allen, department store programs, even *Model Airplane News's* International Gas Model Association. He thought some of you OT'ers might have photos, literature, models, plans, or whatever from that period. Your cooperation would be appreciated by all!

AND FROM DOWN UNDER

A nice thank-you comes from Bob Mercer of 105 Sultana Rd. W., High Wycombe 6057, Perth, Australia. Bob maintains one of the finest OT R/C collections in Aussie country with an objective to keep early R/C alive and flying. He also repairs and maintains OT R/C systems for others.

In the past, I've mentioned that Bob was (and still is) anxious to acquire any and all OT R/C equipment—even bits and pieces. He now reports that your response was excellent and is very thankful for the good showing. In the process, he has come to know many, many R/C'ers from around the world, and he reports that he has some wild tales from his experiences. Bottom line? If you have OT R/C equipment and would like to put it into good hands where it will be appreciated, do contact him!

So, that's the way it was and is; do remember, this is your OT R/C place! ✚

THE PURPOSEFUL march by 3W-Modellmotoren Germany, the manufacturer of large model engines (distributed in the U.S. by Desert Aircraft*), continues with this unique foray into a smaller engine area: the renowned international competition F3A aerobatic class.

The recent FAI rule change allowing any engine to compete has opened up many possibilities, one of

MODEL AIRPLANE NEWS ENGINE REVIEW

by MIKE
BILLINTON

DESERT AIRCRAFT

3W-24

Gas engine for F3A pattern

the more interesting being that reliable industrial-style engines can get to prove their mettle against the more usual model engines that have dominated the F3A scene since its inception.

3W-Modellmotoren of Rodermark has been in the news more recently with a staggering result list in the USA's Tournament of Champions event, where their engines powered 17 out of 20 aircraft piloted by many of the world's top aerobatic performers. The 3W engine sizes used there range from 70cc to 160cc.

The full 3W range is from 240cc (flat-4) down to the very new and smallest of their engines, the 24cc single, which is the subject of this test.

In many respects, this small engine should represent a severe hurdle to the 3W company because some of the industrial engine features they are familiar with become more difficult to achieve as size is reduced, which probably explains why this engine style is rarely seen below 20cc.

THE PROBLEM AREAS

1. The one-piece aluminum cylinder block chromed internally. With no separate cylinder head, cylinder honing must be accomplished from the bottom of the block into a blind end.

Also, the various "cast-in-situ" transfer ports present ever greater problems as bore size is reduced. Note, therefore, that this new "small" 24cc engine uses a proprietary block made by DCR in Italy and has a largish bore of 1.026 inch, which then results in an under-square stroke/bore ratio of .7656:1!

2. Roller-bearing arrangements in both big and little end of the hardened-steel connecting rod are both costly to produce and demand extra crankcase space.

3. Twin crankwebs are still felt to be important, but they also present extra manufacturing and space problems.

Interestingly though, the consequent difficulties

to be essential in this manufacturer's view, so the extra cost of electronic systems must be incurred. However, a brief look at the respective fuel-consumption figures for gasoline versus methanol with 10 percent nitromethane shows a 3 to 1 ratio in favor of gasoline (as measured during this test).

So the hours of practice seen in the F3A class will find fuel savings swiftly overtaking the initial electronic spark costs, and that is without considering the extra oil content costs (methanol engines use 18 percent, while gasoline engines use 3 percent maximum.)

5. Gasoline's disadvantage is both the slight power loss compared with methanol and the increased fire hazard, though availability is obviously superior.

These various plus/minus points have yet to be fully appraised in the F3A scene because gasoline engines have not figured in competition so far, largely because the

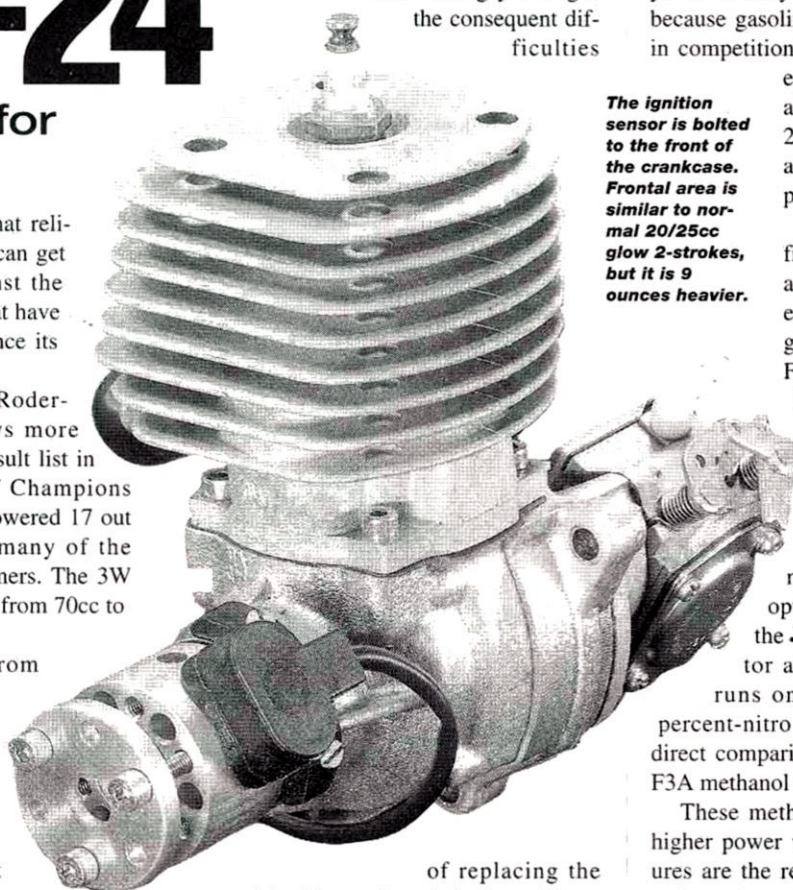
earlier FAI engine ruling disallowed capacity above 10cc 2-stroke and 20cc 4-stroke, and this favored the glow-plug engine.

With the new rulings now firmly in place, it can only be a matter of time before engines such as this 3W-24 gasoline/spark find favor in F3A on their merits, though it's equally probable that use by a well-known name will also lead "by example" to wider acceptance.

The large bulk of this test used gasoline (the manufacturer's preferred option), but some brutality to the Walbro diaphragm carburetor allowed meaningful power runs on methanol fuel with 10-percent-nitro additive and thus enabled direct comparisons to be made with other F3A methanol engines.

These methanol/nitro results produced higher power values, but the gasoline figures are the relevant ones for most users and are those that the manufacturer would feel responsible for.

One useful outcome of the new FAI engine rulings is that, with airframe size/weight restricted, there is much less need for concentrated pursuit of maximum power. There now appears to be more than enough of this aspect, so other matters of engine performance become more significant, i.e., engine control and throttling, flexibility of power production, costs, starting, consistency of performance and reliability, etc.



The ignition sensor is bolted to the front of the crankcase. Frontal area is similar to normal 20/25cc glow 2-strokes, but it is 9 ounces heavier.

of replacing the conrod in this crank style is, in reality, a problem immediately turned on its head because replacement is not felt to be necessary during the reasonable life of the engine. Therefore, the provision of supremely rigid twin crankwebs becomes viable.

This type of thinking suffuses the entire industrial engine concept's very much a "fit and forget" attitude; and the F3A "modeling" class could arguably benefit from more of this.

4. Spark ignition and gasoline are also felt

Using this much wider evaluation throws up different answers, and it would be very debatable just where, using those other criteria, the F3A engine scene will find itself two years from now.

UNUSUAL MECHANICAL POINTS

There are, of course, quite a number of these.

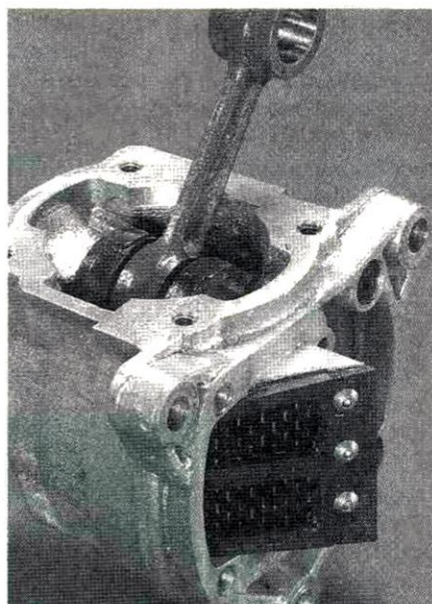
Starting at rear, the Walbro pumper carb gives exemplary fuel delivery at any aircraft attitude or G-forces. To the writer's knowledge, this carb type has not seen action in F3A contests to date.

The rear-induction carbon-fiber reed-valve system is angled to reduce severe changes of gas-flow direction and also results in immediate lubrication of the big end by incoming gas stream.

The lower crankcase is split vertically in two, with pins locating the two halves. The front half contains two sealed main bearings to support the small 10mm main shaft, while the rear half has a single sealed bearing for the 8mm rear shaft. This rear half incorporates the triangulated rear radial mount.

The engine has sensibly short overhang (from radial mount to prop driver) of only 3.9 inch (99mm).

The cylinder block weighs 10.85 ounces and takes a normal, 10mm "full-size" short-reach plug (NGK CM-6). Standard Schnuerle transfer and boost portings are quite small and suggest future extra performance is available. The combustion cham-



Twin carbon-fiber reed-induction valves are angled for improved airflow into the lower case. Note the combined short-coupled rear radial mount and crankcase half.

ber is "bowler hat" shape, and the compression ratio at 8.4:1 is higher than those of glow engines of similar size. The adjustable spark-ignition point allows this, whereas the glow plug imposes its own ideas of what compression ratio is allowable.

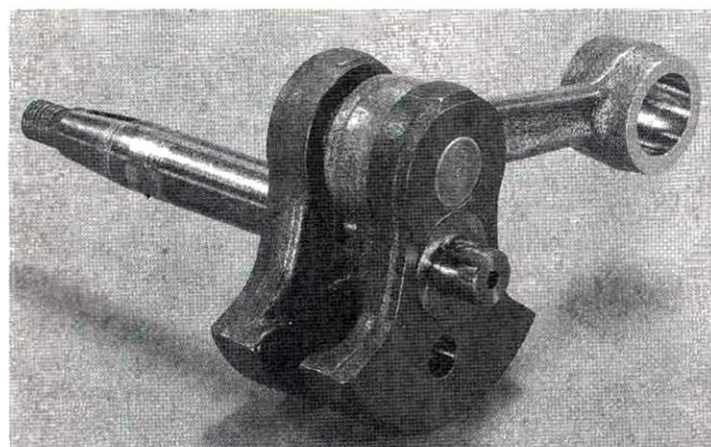
The aluminum-alloy piston has a single compression ring set below its crown and pegged to prevent gap rotation. Piston weight at 1.15 ounces compares most interestingly with that of similar capacity F3A

WEIGHTS AND DIMENSIONS

Capacity	1.4469ci (23.71cc)
Bore	1.340 in. (34.04mm)
Stroke	1.0266 in. (26.06 mm)
Stroke/bore ratio	0.7656/1
Timing periods	Exhaust 147° Transfer 116° Boost 114° Blowdown 15°
Combustion volume	2.2cc
Compression ratios	Geometric 11.77:1 Effective 8.4:1
Exhaust-port height	0.32 in. (8.13mm)
Cylinder-head squish	0.041 in. (1.06mm)
Cylinder-head squish angle	1.5°
Squish-band width	0.275 in. (7mm)
Carburetor bore	0.54 in. (13.8mm)
Front crankshaft diameter	0.3935 in. (10mm)
Rear crankshaft diameter	0.314 in. (8mm)
Crankpin diameter	0.3935 in. (10mm)
Wristpin diameter	0.3545 in. (9.01mm)
Connecting-rod centers	2.046 in. (52mm)
Engine height	5.55 in. (141mm)
Width	3.2 in. (81.2mm)
Length	6.3 in. (160mm)
Mounting-hole dimensions	Triangulated rear mount spacing 70mm wide x 66mm high
Exhaust-manifold bolt spacing	1.18 in. (30mm)
Frontal area	9.3 sq. in. (with manifold: 10.2 sq. in.)
Weight (bare)	40 oz. (1134 gm)
—w/ignition and 1700mAh battery	52.6 oz. (1491 gm)
—w/Kremscheid pipe/manifold/ign. and battery	64.3 oz. (1823 gm)
—w/Bolly pipe/manifold/ign. and battery	63.4 oz. (1797 gm)
Crankshaft and rod weight	7.2 oz. (205 gm)
Piston weight	1.15 oz. (32 gm)

Manufacturer: 3W Modellmotoren

USA distributor: Desert Aircraft, P.O. Box 18038,
Tucson, AZ 85731; phone/fax (520) 722-0607.



Left: hardened-steel rod and twin crankwebs are highly unusual in F3A competition engines. Right: the piece in the right foreground is the "aerodynamic" spacer that connects the reed-valve assembly in the rear crankcase to the carburetor.



ENGINE REVIEW—3W-24

"model" engines—O.S. 140 and Webra 120, which are both near to 0.66 ounces! This reflects the gasoline engine's need for extra heat-sink capacity. The methanol engine can rely to greater extent on that fuel's capacity to take away extra heat, and so generally less metal can be used without problems.

Thyristor ignition is triggered by small magnets in the prop driver, and timing point is varied electronically and automatically—dependent on rpm—over the range 0- to 30-degree advance.

Overall bare weight at 40 ounces compares with O.S. and Webra weights of 29 ounces and, of course, the addition of ignition equipment and battery at 12.6 ounces increases this differential. However, in exchange, one obtains a degree of reliability and reduced running costs that the normal "model" engine cannot emulate.

PERFORMANCE

A consequence of the strong mechanical design features of the 3W-24 is that the only area that does need running in—the

piston, ring and liner—keeps on benefiting from continual use.

Several propellers, including likely F3A sizes, were used throughout this test, and in all cases, rpm kept on drifting upward by small increments over the approximately 3 hours of running, although improvements had flattened out by the time of max power runs.

TEST 1. OPEN EXHAUST

Fuel: unleaded gasoline with 3 percent Shell Helix synthetic oil; spark ignition.

Using gasoline, comparative torque figures were slightly below the Webra 120's methanol/nitro results; but using that same more powerful fuel resulted in virtually identical specific figures of 231 oz.-in. per cubic inch.

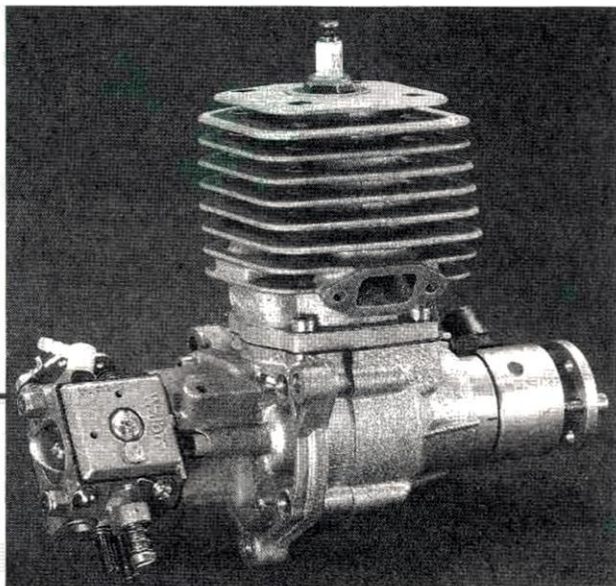
Tests beyond 12,400 were curtailed to ensure engine survival for the

many tuned-pipe tests to follow. In any event, torque was beginning to decline at an accelerating rate, due no doubt to general breathing restrictions.

TESTS 2, 3 AND 4. KRUMSCHEID QUIET TUNED PIPE

Same fuel and ignition as in Test 1.

This pipe utilizes the now familiar internal flat reflector disk to initiate acoustic pulses. As with previous Krumscheid pipes, the result is modest power uplift (over open-exhaust figures) but



Performance

Maximum power	3.06 @ 12,000rpm (open exhaust)
	2.75 @ 10,900rpm (Bolly pipe @ 590mm/petrol)
Maximum torque	328 oz.in. @ 5,880rpm (Bolly pipe @ 710mm/petrol)
	303 oz.in. @ 7,700rpm (open exhaust/petrol)

Rpm on standard props

	Open exhaust	750mm	Krumscheid pipe @ 650mm	580mm	710mm	650mm	590mm
20x10 Menz	—	5,780	—	—	5,710	5,500	5,160
21x10 Bolly	5,800	6,065	6,610	—	6,080	5,980	—
	(6,440)	—	—	—	—	—	—
18x12 Menz	6,090	6,150	6,342	6,390	6,340	6,430	6,100
15.5x12.5 4-blade Bolly	6,520	6,310	7,010	6,690	6,740	6,945	—
	(7,030)	—	—	—	—	(7,260)	(7,540)
18x8 Merati	7,090	—	7,295	—	—	7,260	—
17.5x12 Bolly	7,440	6,765	7,495	7,600	—	7,460	7,650
16x14 APC	7,490	—	7,500	7,630	7,350	7,510	—
	(7,860)	—	—	—	—	(7,820)	(8,244)
16x6 Merati	9,310	8,850	8,995	9,280	—	9,160	9,340
15x8 Graupner	10,050	—	—	—	—	—	—
15x8 APC	10,290	—	9,690	0,140	9,410	9,870	10,350
	(10,640)	—	—	—	—	—	(10,620)

Performance Equivalents

B.hp/ci	2.11	—	1.63	—	—	1.64	1.90
	(2.20)	—	—	—	—	—	(2.27)
B.hp/cc	0.129	—	0.099	—	—	1.00	0.116
B.hp/lb	0.93	—	0.59	—	—	0.60	0.69
B.hp/kilo	2.05	—	1.30	—	—	1.32	1.53
B.hp/sq. in.	—	—	—	—	—	—	—
frontal area	0.33	—	0.23	—	—	0.23	0.27
Oz.-in/ci	209.40	—	219.80	—	—	223.20	221.20
	(231)	—	—	—	—	—	(287)
Oz.-in/cc	12.78	—	13.40	—	—	13.60	13.50
Oz.-in/lb	92.10	—	79.10	—	—	81.40	80.60
Foot.-lb/ci	1.09	—	1.14	—	—	1.16	1.15
N. meter/cc	0.090	—	0.096	—	—	0.097	0.096
N. meter/kilo	1.45	—	0.25	—	—	1.28	1.27

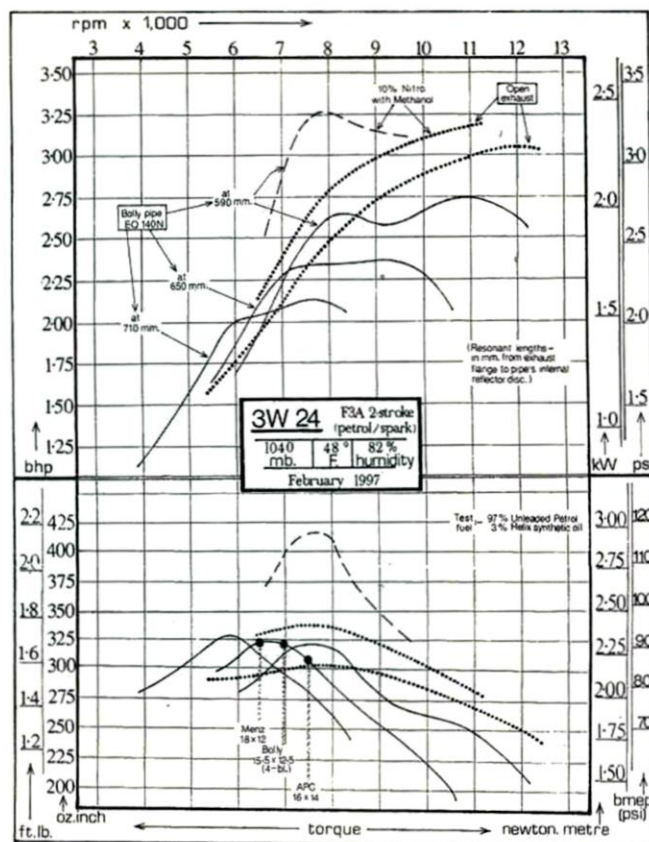
*Note: all figures in parenthesis = 10% nitro/methanol fuel. All others = petrol fuel.

having mild flexible operating characteristics.

Based on previous findings, the three tuned lengths chosen covered the maximum spread of operating rpm likely to be used in F3A, constrained as this class is between the need to keep sound levels down and the opposing need for reasonable power.

Judging by these test results, resonant lengths between 650mm and say, 700mm look correct. Of the propellers available, Bolly's unusual and finely constructed 4-blade 15.5x12.5 seems ideally placed on the hp curve, with maybe a bias toward a 670mm operating length.

At 650mm., the fuel consumption of 25cc/minute is worth noting and contrasts vividly with the 80cc/minute using methanol/10 percent nitro.



TESTS 5, 6 AND 7. BOLLY QUIET TUNED PIPE

At the normal usable length of 650mm, the Bolly pipe generated slightly more power than the equivalent Krumscheid test but revealed sharper initial rise to full resonance in the 6.5Krpm area. In general, however, and at other lengths, the Bolly pipe generated extra torque, though sound levels subjectively appeared slightly higher.

Due to continual high winds at testing time, no formal dB sound checks were possible.

TESTS 8 AND 9. METHANOL/ 10-PERCENT-NITRO FUEL

Open exhaust and both pipes.

These necessarily occurred after all the formal gasoline tests had been finalized because of the uncertain outcome of tampering with the Walbro carb sufficiently to allow the much greater fuel flow consequent on methanol/nitro use.

Initial use of a Rossi 90 marine carb. proved to have adequate control and fuel flow but suffered from lack of carb bore. So the final decision to attack the Walbro's internals was taken in the pursuit of information concerning the 3W's capabilities compared with its methanol competitors.

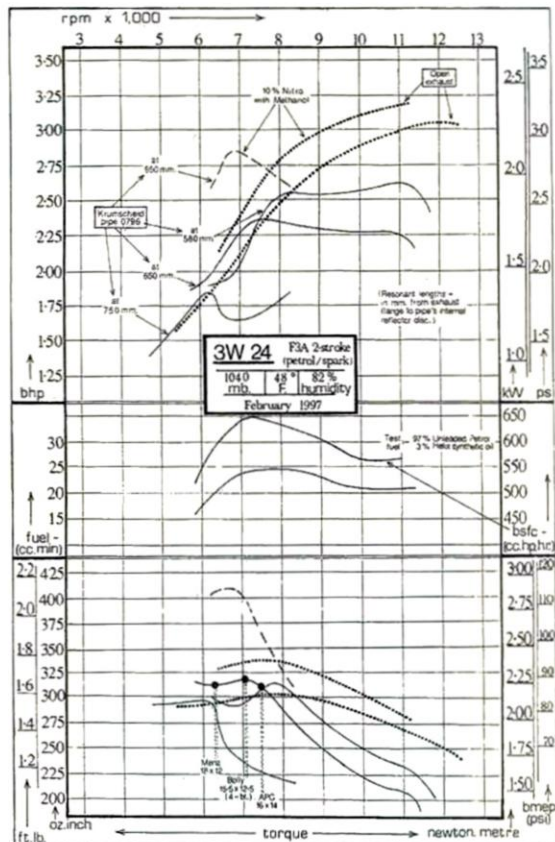
Well outside the limits of both engine and carb guarantee, the main fuel jet (high) was drilled out from its initial 0.8mm

diameter to a new 1.8mm. This resulted in no change in fuel flow. Further inspection revealed that the quite separate final "issuing jet," which protrudes into the carb venturi, was itself also a restriction of around 0.8mm and, therefore, after extra work, this, too, was opened out to 1.8mm.

The immediate result was adequate flow using the methanol/10-percent-nitro fuel—just enough, in fact, to ensure sufficient initial richness of operation. This amount of extra richness varied with rpm, becoming marked at higher speeds but only just sufficient below 7,000rpm. This suggests that the carb's internal pumping rate was now varying with rpm at a greater rate than prior to alteration. Suffice to say that further opening up of both jets to, say, 2mm diameter looks likely get the most flow one could need (say for more nitro content).

Conveniently at the 1.8mm "oversize," a return to gasoline fuel proved still to have just sufficient controllability, though with main needle needing to be almost fully shut to give correct fuel supply.

Actual rpm and power results are clear from the graph. Dynamically, this was also clear on the dyno with a much harder, more aggressive outcome from the various setups, and it served to confirm Peter Wintrich's (3W) view that comparing this 24cc gasoline engine directly with its



methanol competitors is not "comparing like with like," the strongest example being the over 400 oz.-in. of torque now released by both Krumscheid and Bolly pipes.

Despite 3W's real love affair with gasoline, there may yet be developments to allow occasional use of methanol in some of their engines.

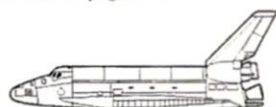
IDLING

Using gasoline, Krumscheid pipe at 650mm and 16x14 APC allowed 1,760rpm with idle needle open 1.5 turns. Alternative use of the higher inertia Bolly carbon 4-blade prop allowed a lower figure of 1,640rpm.

SUMMARY

It is undeniable that, in its standard gasoline form, the 3W-24 operates at some disadvantage to the methanol engines currently ruling the roost in F3A. However, it operates in such a smooth, gentle manner that its other qualities may well force this fine strong engine into deserved contention.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.



by **BOB UNDERWOOD**

TIPS TO BEAT THE COMPETITION

This month's column discusses different modeling techniques; one is physical or operational and the other, psychological. The photos only relate to the former, since I couldn't find any that revealed the latter!



Switches, air filler and charging jack are hidden in the nose of a P-38.

HIDIN' 'N' HOLDIN'

At some point in the construction of a scale model, we're faced with the problem of hiding the elements needed to service the model or to adjust things like the needle valve. Nothing detracts more from the appearance of a scale model than big old switches, charging jacks, fuel fillers, retract valves, etc.; hiding them becomes a game! Now, where?

There are a host of places—doors, hatches, nooks and crannies—where you can hide things on most scale models. The key is to make the hidden model part functional and user-friendly and have it look scale. It's

much better to bunch the service points in one spot. In my soon-to-be-completed Stormavik, one simple "hatch" provides access to two Du-Bro filler valves (one is for overflow in the pressure line), the radio switch, charging jack, onboard glow charging jack and the retract filler valve. The cover plate and one screw fitting take just seconds to open or close.

A few photos from this year's Top Gun provide some clues about where to find hiding places. A neat one was found on David Hayes' P-51. When you poked the wing-root gas filler cap down, it swung out of the way and the retract filler valve took its place. Unfortunately, Dave's model went to the great model heaven in the sky before I got a photo, and then I forgot to ask him how it worked!

Needle-valve adjustments are many and varied. Some guys use a fitting on the end of the needle itself and place a very small hole in the fuselage side that's in line with the fitting. In some cases, a piece of aluminum tube is used to guide either a screwdriver, or something similar, to the fitting. A Phillips or Allen ball driver is preferred over a slotted screwdriver. If you have an accessible cabin or cockpit, you can use a piece of flexible cable curved in an arc from the needle valve to an out-of-the-way (and out of sight!) place.



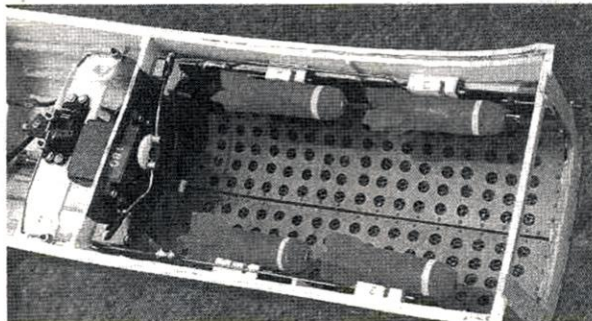
There's always a hatch somewhere!

For instance, the O.S. 1.60 twin on my Hiperbiplane has a ready-made hole in the needle valve that will accept the cable, tightened by a screw. The other end of the cable goes through the firewall under the instrument panel and has a brass tube soldered to it at a right angle for a grip. Play around with the non-scale items. You'd be surprised what you can do to hide "stuff."

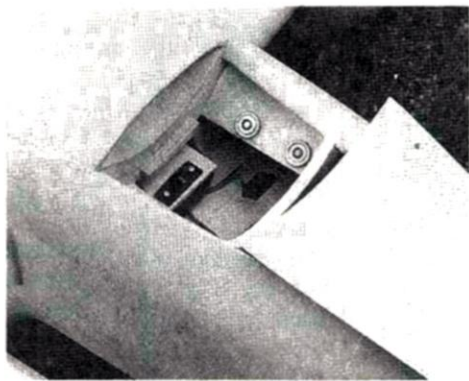
Some models need extra help when they're being transported; special cradles are common. Notice what Mike Winter had to do to prevent his model's cabane from breaking on the way to and from Top Gun.

SIGMUND FREUD TIME

I'll probably get into trouble with this part—but what the heck! Scale competition is unlike competition in most other forms of aeromodeling where, for the most part, the aim is to stay up longer, go faster, etc. These competitions are based on a



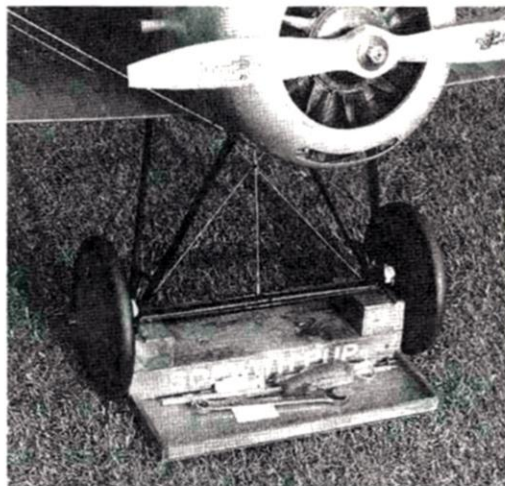
Hal Parenti's B-25 bomb bay can be pulled off in one piece to be reloaded. The 180-degree servo opens the bay doors (at bottom), and the bombs are staged with wires of different lengths so they fall one at a time. Bomb numbers match the rack numbers.



All service needs have been tucked into one place on my Stormavik.

stopwatch, or who gets there first. True, we have control-line (CL) and R/C events in which subjectively judged "patterns" are performed in the sky, but the patterns are identical for each class of competition; thus, what is judged are the minute differences between the various competitors.

Scale modelers must have a masochistic streak because they receive *two* scores, and *both* are subjective! Where the so-called "pattern" or "stunt" events tend to breed a specific type of aircraft to fit the current trend, scale models span the spectrum from Blerrots to swoosiiing turbines, each requiring different maneuvers. In every case, the task for the scale competitor is to convince the static and flight judges that they are viewing a miniaturized version of the full-scale aircraft. This in itself is no mean task, since *no* judge has ever had the opportunity to see all the varied types of individual aircraft found throughout the history of powered flight.



Kim Foster's Pup knows how to prevent flat wheels. Smart dog!

The competitive edge for CL and R/C "pattern" folks is to conceive the design that flies the best, use the best equipment and practice, practice, practice! When the judges do their jobs correctly, it boils down to the "minute difference."

Now, where's the edge for the scale competitor? Certainly practice is a factor, as is good equipment, just as in the pattern competition. But there are pronounced psychological aspects, as well, during flight and static judging. Let's explore some of them.

1. Choice of model.

An aircraft with a few built-in "10s" is always a good choice; however, this has ensured less of an edge in recent years. Although multi engines—if kept running through the entire flight—almost always garner a 10, other so-called "mechanical" options that used to enjoy an edge, now generally don't.

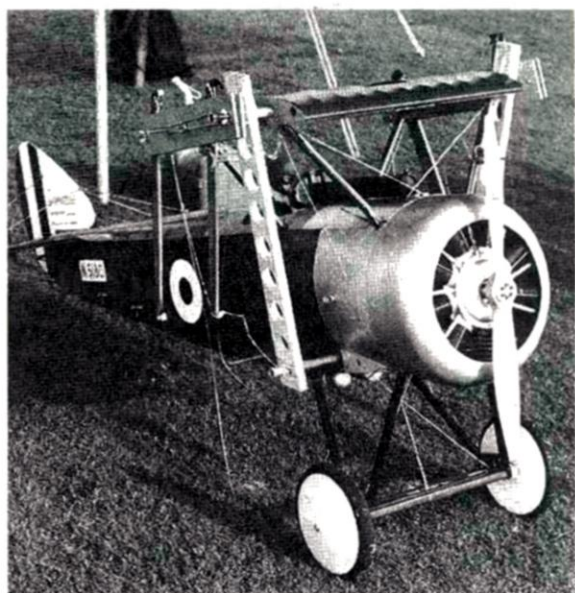
To me, the real edge comes from selecting a subject that's different. If you show up with a P-51 or a J-3 Cub, there are negative factors to overcome right away.

First, there's likely to be three of each at the event, and yours has to be the "definitive" version; it will have to be much better than the others to be at the top of the heap. Secondly, judges generally know (or *think* they know) the aircraft very well. I have great admiration for judges who don't have preconceived notions about aircraft. (I remember seeing Leo Laudenslager for the first time at Oshkosh with the full-size *Bud Light*, as well as the maiden performance of a full-size *Ultimate*. Those aircraft banged around the sky with movements that

were "model-airplane-like"—not at all smooth and easy.) You also have to overcome a loss of spontaneity, or freshness.

An edge comes from choosing a model that isn't well known. If the judges have never seen what you present, then they're starting with clean slates as far as comparing it to the documentation.

If your model isn't one of a kind, choose markings that catch the eye. If you placed the version of the Hiperbiplane I've flown next to that of the Sorrel prototype, many more photos would be taken of the version I



Mike Winter's traveling stuff prevents the cabane from shaking itself apart on rough roads (the model is pulled in a trailer).

modeled, just because of its paint scheme. Flashy military markings will do the same thing.

2. Listen to the judges. You can put the best done model in the world in front of the judges, and they'll still knock off points for things that may even be correct. My July '97 "Scale Techniques" column (written before this year's Top Gun) addressed this issue. If you carefully consider *why* the judges downgraded (if they don't write comments, ask) and attempt to clarify or improve your presentation, you'll find that you can usually improve the overall score. Time and time again, I've heard contestants suggest that the judges' lineage was questionable because they didn't "see"

the model correctly. Competitors need to remember that perception is reality; judgment calls are *never* wrong! When an umpire calls a pitch a strike, he isn't wrong; he just made a slightly different judgment call than you did. Remember, when you signed on to compete in scale, you agreed to accept the *judgment* of others. If you can't live with that, then you really need to try pylon racing or something that's not judged subjectively.

3. Read the judges. Hang around the judging areas. Study the judges' reactions to the competitors. It doesn't take a degree in psychology to determine how they respond to various personalities. I've seen competitors who approach the whole scene with a "me vs. them" attitude, which isn't terribly productive. You'll be far better off if you approach it from the viewpoint that the contest is a cooperative effort to provide the best competition possible.

Communication is most critical during the flying part of a competition. I've always found that providing commentary relative to the flight characteristics, performance and scale of the actual aircraft is valuable, particularly in light of the unusual aircraft I tend to choose. It helps to be specific in describing exactly what you will be doing. Don't just call the roll; describe what it will look like! Of course, it helps to then fulfill those expectations. Some flight judges prefer less dialogue during the flight. Again, by viewing other competitors flying—and noting the judges' responses—you can get a feel whether to be gabby or silent.

At the conclusion of the flight or static judging, it never hurts to thank the judges for their kind attention. After all, they're out there in the hot sun for hours, usually as volunteers, while you do your thing and then hustle back to the shelter for a cold drink!

In closing, try to remember:

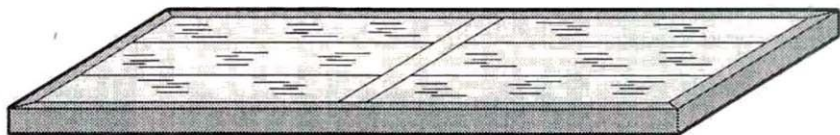
- Every competition is a learning experience.
- Perception is reality.
- Judgments are never wrong.
- You can only make it difficult for yourself.

See ya at the next contest!



BALSA WORKBOARD

RESISTS WARPING • BUILDS TRUE • LONG LASTING



2 SIZES AVAILABLE

WB36 36"x14"x1" ... \$20.98 **WB48** 48"x14"x1" ... \$23.98

Add \$5.00 per board for shipping and handling
MA residents add 5% sales tax
Prices subject to change without notice
Allow 3 to 4 weeks delivery



PAUL K. GULLOW, INC., P.O. Box 229 Wakefield, MA 01880
617-245-5255 fax: 617-245-4738 INTERNET: GULLOW@AOL.COM

Shirts \$12.95



Hats \$9.95

AIRPLANE FACTORY, INC

1135 FLORIDA, MANDEVILLE, LA 70448



Radios

Engines

BASIC TRAINER \$84.95 (\$5.95 P&H)

NEW AT THIS or want a gentle sport plane? You need our "KOMBAT 40 BASIC TRAINER". Why spend days, weeks or even months building a trainer just to see it SMASHED TO SMITHEREENS while learning. Fly in an hour! Everything, except the radio and engine, is in the box. No Gluing, No Covering, No Sanding and No Tears when you CRASH! All that is required is a .40/.46 size engine and a four channel radio. With a big 60" wing span, tricycle gear and weighing only 5-1/2 pounds, the "BASIC TRAINER" is easy to land and can take some real punishment. Most crashes usually result in just a couple of broken nylon bolts, which can be easily replaced in minutes to keep you flying for hours! Available in Red, Yellow, Orange and Blue. Order one today! (Sport model KOMBAT 40 also available only \$74.95)

VISA/MC/AMEX/COD **1-800-264-7840** FREE CATALOG (504) 626-7840



TNR

TECHNICAL, INC.

Your Largest Stocking Distributor
For **SANYO** Batteries

Call for Competitive Pricing

FREE CATALOG

Receiver & Transmitter Packs • Laptops, Camcorder, Cellular
Sealed Lead Acid, Lithium, & More

Immediate Delivery • Custom Assemblies • Technical Support • Full Production Facilities

301 Central Park Drive • Sanford, FL 32771

(New Location, Same Owner!)

Fax 407-321-3208

email - tnrbattery@aol.com

800-346-0601

Web - <http://www.batterystore.com>

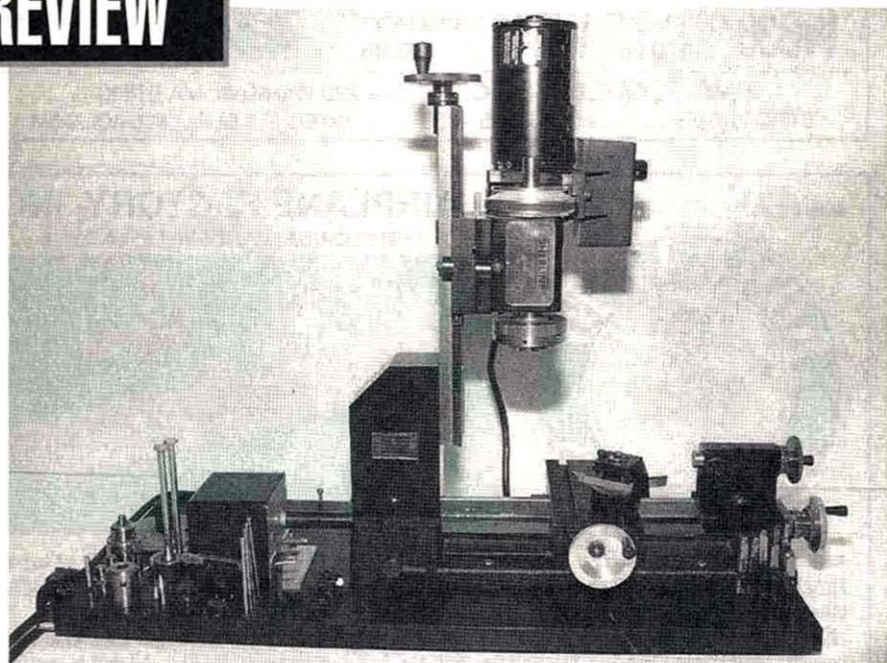


MODEL
AIRPLANE
NEWS
**PRODUCT
REVIEW**

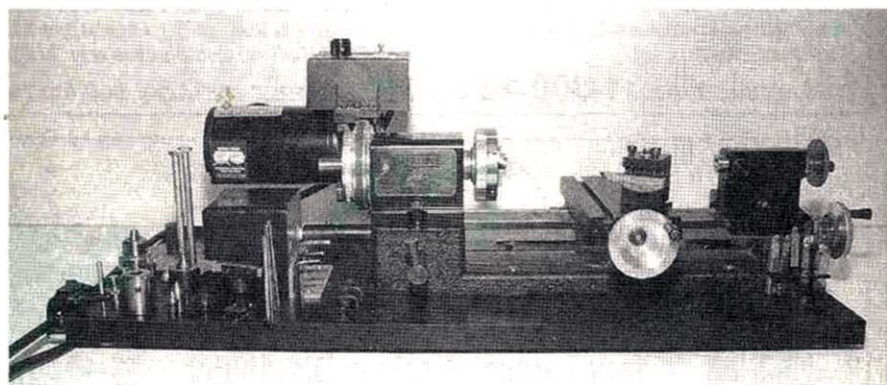
Precision tools for the modeler

Sherline Mill

by JIM SANDQUIST



Above: the complete Sherline Mill setup. Below: the basic lathe setup. This entire changeover takes less than one minute!



DO YOU NEED scale machine-gun barrels? Landing-gear-door mounting brackets? Custom muffler extension? Scale wheels? How do you go about making items such as these? I recently had the chance to get my hands on the answer to these problems: a Sherline® Mill. This article is a follow-up to my Sherline lathe review in the June '96 *Model Airplane News*. As I stated then, this is a product that the serious modeler will literally find hundreds of uses for, and it will last for years.

LATHE VS. MILL

You may be wondering what the difference is between a lathe and a mill. Simply put, a lathe turns metal or wood stock on a horizontal plane, allowing you to cut in two dimensions. A mill will hold the stock stationary while a milling tool turns to cut the stock. The mill can move the stock in X, Y and Z axes, allowing you to work in three dimensions. At first glance, it looks a bit like a drill press, but unlike a drill press, a mill can take the force of side loads and end loads. Because your tool turns and the work is stationary, larger

stock can be handled in the mill and the stock does not have to be round.

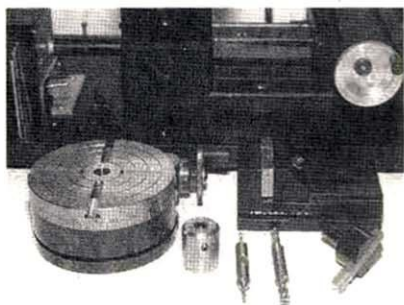
Which tool is most useful? That's hard to say. Both have specific jobs to do. I started with the lathe and found that I needed the mill for certain applications. If I had started with the mill, I am sure I would have had a need for the lathe. For me, the solution was to have both! You can purchase the lathe and mill separately, or you start with the lathe and then add the vertical milling column. This allows you to use the existing base and motor from your lathe and convert it to the milling machine! In less than one minute, I can convert my lathe to a mill or vice versa!

This is no exaggeration—less than one minute! With these tools, you can make virtually any part you need. Not too many products on the market can make that kind of a claim.

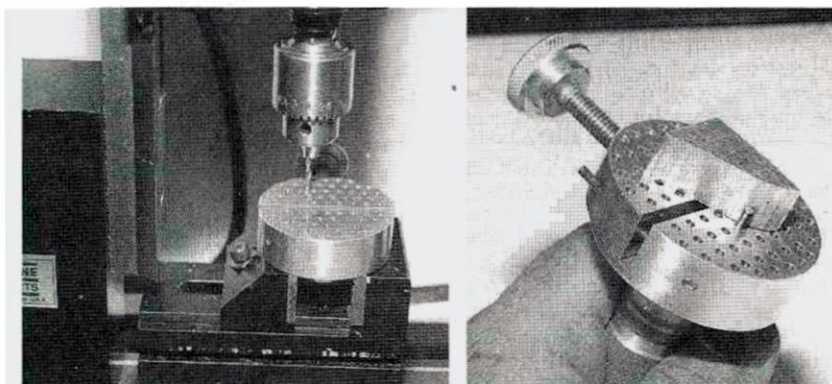
THE BASIC PACKAGE

By adding the vertical milling column to my lathe, I needed a few basic tools to do the majority of model applications. At minimum, you'll need:

- **Machinist's vise.** This has a couple of unique qualities. First, it's designed to hold solid stock up to 2 inches wide, and its fixed jaw has vertical and horizontal grooves to facilitate holding bar stock. Unlike a cheap drill-press vise, this vise can be accurately aligned to the machine. The jaws clamp onto the stock and also pull down to keep the jaws from lifting; this results in a very secure hold down of the stock you are machining.



A few of the available milling accessories. Left to right: rotary table, end-mill holder and end mills, machinist's vise and the fly-cutter.



Left: precision drilling and spacing is easily accomplished with a milling machine. **Right:** this unique hand-held vise is capable of holding small and odd-shaped objects and was created with the combination of the mill and lathe.

• **End mill holder and end mills.** End mills are used a lot. These are cutting tools that allow you to face off small areas and cut slots. End mills come in a variety of sizes, ranging from $\frac{1}{32}$ up to $\frac{3}{8}$ inch, and they are made out of high-speed steel or carbide steel to accommodate cutting and slotting a wide range of metals.

• **Boring tools.** Unlike drills or end mills, a boring tool is infinitely adjustable and allows you to make holes in any diameter between $\frac{1}{4}$ and $1\frac{3}{4}$ inches. It's also capable of being used for stepped holes for seating bearings and internal grooves for locking rings.

• **Fly-cutter.** This nifty tool allows you to face off and machine large, flat surfaces. It's a single-point tool that can be adjusted up to a 2-inch diame-

ter and can make a deep, .010-inch cut in aluminum in a pass.

• **Jacobs drill chuck.** This standard chuck came with the lathe, but it is very helpful for precision drilling.

• **Rotary table.** This has sharp and precise lines laser-engraved every 5 degrees. The handwheel is divided into 50 parts, so each line on the handwheel is $\frac{1}{40}$ degree. This allows a circle to be divided into 3,600 increments. How's that for precision? A rotary table used with a mill allows you to produce virtually any part you can design. The only limit is the size—not the complexity.

Depending on your needs, the mill can be configured with a variety of accessories, such as milling collets for holding miniature end-mill cutters, a right-angle attachment for the rotary

SPECIFICATIONS

Model: 5000 Mill

Maximum clearance, table to spindle: 8 in.

Throat: 2.25 in.; 3.5 in. with optional head-stock spacer

Travel, "X" axis: 9 in. on mill model 5000, 2.5 in. on the mill conversion as reviewed.

Travel, "Y" axis: 3 in.

Travel, "Z" axis: 6.5 in.

Hole through spindle: 0.405 in.

Spindle nose thread: $\frac{3}{4}$ in./16 TPI

Spindle taper: no. 1 Morse

Handwheel gradations: 0.001 in.

Electronically controlled spindle speed range: 70 @ 2,800rpm

Width overall: 14.75 in.

Depth overall: 11.75 in.

Height overall: 20.75 in.

Hold-down provision: 2 "T" slots

List prices: \$120 (vertical milling column as reviewed); \$500 (free-standing vertical milling machine, Model 5000).

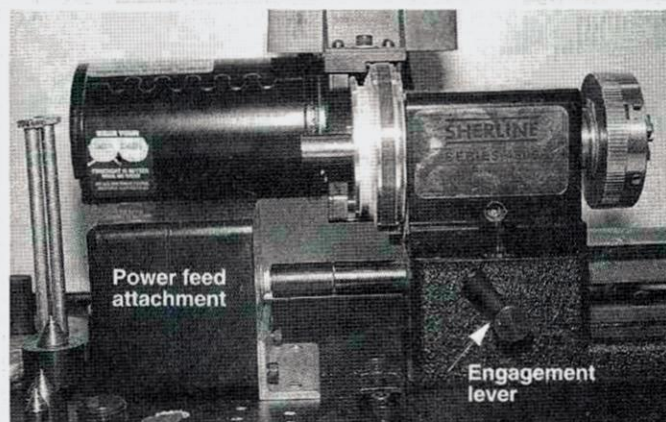
Comments: having no previous experience with a mill, I was unsure of my ability to use it. The well-written instructions for the use of the machine and each accessory allowed me to make each item I set out to. It is a well-built product that should provide years of use.

Hits

- Easy to use.
- Clear, well-written instructions.
- DC motor that requires no maintenance.
- Highly accurate.
- Versatile accessories.

Misses

- None.



Since getting this attachment, I cannot imagine using the mill or lathe without it. I get better results with less hands-on involvement while making a part. Consider it a must-have accessory for your machine.

SHERLINE'S OPTIONAL POWER FEED

When I did the lathe review, one accessory that I did not have was the power-feed unit. Without it, you feed your stock by turning the handwheels manually. Obtaining a good finish on parts requires slow, steady movement on the cutting tool. This is hard to achieve when feeding the tool by hand. It becomes particularly tedious when reducing the diameter of a long part or long shaft.

This simple power-feed attachment consists of a constant-speed gear motor with an on/off switch. The engagement handle allows you to engage or disengage the power feed at any time. This accessory is not only beneficial in feeding stock in the lathe, but is also useful for feeding stock into the mill. The feed is from right to left at a constant speed of 0.900 inch per minute.

SHERLINE MILL

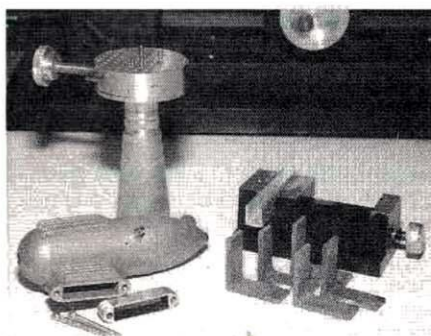
table to allow you to cut gears, special hold-down plates to keep stock in place while being milled and slitting saws for cutting thin slots into metal.

OPERATION

Just as with the lathe, I had never used a milling machine, but the supplied instructions got me through the basics and allowed me to start making parts right away. Each of the milling accessories comes with its own instructions.

Accurate movement, cutting depth and cutting distance are controlled by the laser-engraved handwheels, which are available in English or metric.

This mill is capable of being used to mill and cut annealed carbon steel, cast iron, mild steel, brass and aluminum. The instructions give you guidelines and tips so that you will know the speeds for turning and cutting various metals as well as instructions for extremely accurate step-by-step drilling. Figure 1 is an example of



Some of the items made for this review: a hand-held vise; muffler extension; vise; and steel, right-angle stand-ups to hold wing ribs at 90 degrees before being glued to the spar.

SPEED ADJUSTMENT CHART

Spindle RPM = $\frac{3.82 \times \text{SFM}}{D}$

SFM—Is the rated surface feet for milling. For drilling, use 60% of the rated surface feet.

RPM—Is the rated spindle speed in revolutions per minute.

D—Is the diameter of the work in inches.

Material	END MILLS		DRILLS	
	SFM	Cut Speed	SFM	Cut Speed
		$\frac{1}{8}$ " $\frac{3}{16}$ " RPM RPM		$\frac{1}{16}$ " $\frac{1}{4}$ " RPM RPM
Carbon steel	.60	1,800 1,200	36	2,000 550
Cast-iron soft	.50	1,500 1,000	30	1,800 450
Stainless steel	.40	1,200 800	24	1,400 360
Copper	.120	2,000 2,000	72	2,000 1,100
Aluminum bar	.400	2,000 2,000	240	2,000 2,000
Aluminum cast	.200	2,000 2,000	120	2,000 2,000

Figure 1. Example documentation for determining feed rates for the Sherline Mill.

the included instructional charts. This particular guide helps you to determine the surface feed rates for milling different metals at various rpm and cutting depths.

No longer will you need to labor over a metal fitting or part with a hand file and sandpaper. Scale landing gear, the landing-gear fork and gear-door standoffs, scale wheel covers and metal bezels for instrument panels and scale clevises are just a few things that come to mind. I have also used the mill to make minor alterations to engine cylinder heads and carburetor barrels.

CONCLUSION

This mill is another high-quality Sherline product that will be useful to many modelers. With all metal parts, anodized-aluminum and laser-engraved markings, it will last for years. The only differences between this and a full-size mill are the

size of the parts and the time it takes to mill them.

I got my mill from Jerry Nelson of Nelson Aircraft Company*, a distributor of the complete Sherline product line. If you have any questions, feel free to give him a call. To make the mill or lathe an even better value, mention this article; Jerry is making a special offer to *Model Airplane News* readers.

If you would like to see the full line of products and find out more information, check <http://www.sherline.com/sherline> on the Internet. You can browse through and see the product line, accessories and the prices. Look at the product instructions and tips that they have for using the products, frequently asked questions, project ideas and user testimonials.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.

ELECTRIC POWER THAT EQUALS OR OUT-PERFORMS MANY "GLO-ENGINES"

MEC offers completely wired power packages that can be installed in many "All-Ready To Fly" or "Kit" models with very little modification. NO ENGINEERING DEGREE IS NECESSARY!!!

The "Turbo 10 GT and Plus" systems weigh 10 oz. and the "Turbo 10/20" Brushless motor package has a 13 oz. weight, EXCLUSIVE of the battery pack. Typical "Sub-C" cells weigh 2 oz. each, therefore battery weight is 2 x the number of cells. It is interesting to note that in many cases our all-up weight is very close to the published weight of the "Glo-Engine" versions.

The "Turbo 10 Plus" system gives our RETRACTABLE GEAR, P-51, unlimited vertical climb as demonstrated at the 1996 "KRC Electric Fly-in". The "Turbo 10/20" Brushless motor powers the "Sig 4 Star 40" straight up.

PERFORMANCE RANGE

TT-Plus	3-5 lb models	Fantastic to Excellent
TT-GT	3-5 lb models	Excellent to very good w/longer run time
TT-10/20	4-8 lb models	Fantastic to Excellent

All "Turbo" power systems are extremely flexible and are able to provide the correct type of power for Fighter Planes, Sailplanes, Sea and Float Planes, Sport Planes and Pattern Planes.

Some items available through Tower Hobby and Local Hobby Shops... call for information.

CATALOG \$3.00 **Model Electronics Corp.**
Phone: 206-440-5772 14550 20th Ave. N.E.
FAX 206-440-5905 Seattle, WA 98155



Dual Box allows 2 turbo motors to fly 7-10 lb models w/ease. Dual Box can be used w/single motor and set up for 7.0:1 - 10.0:1 gear ratios. Can turn 13" - 18" props at low amps.

Battery packs feature "End to End" construction to reduce resistance and allow more power out-put than other commercial packs.

MX-50 and MX-80 motor controllers operate on 8 to 23 cells.

Lowest resistance available to give Maximum RPM!! Water Proof!!

Turbo-10 Plus Motor: Outrageous power w/excellent run time.

Light weight and compact!!

Turbo 10 GT Motor: Very good power, longer run time!!

Turbo 10/20 Brushless Motor: Shocking power on 7-20 cells w/excellent run time. Requires slightly larger models.

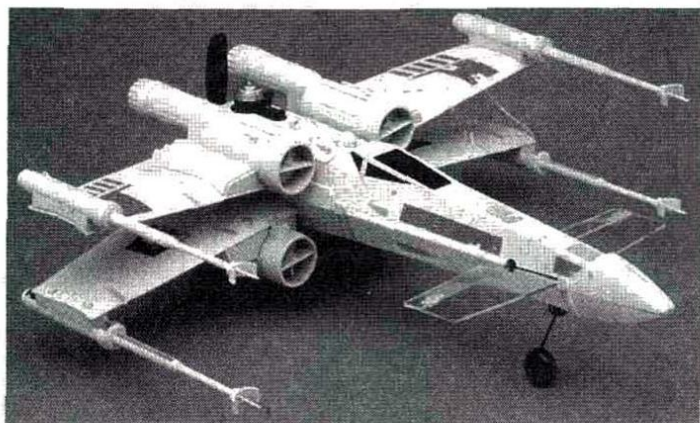
SPECIAL SALE ITEMS

Turbo 10 Plus or GT w/MX-50 controller and 6.0:1 Superbox	\$199.00
Turbo 10/20 Brushless w/controller and 4.3:1 Superbox	\$349.95
Turbo 10 Plus or GT motor	\$89.50
Superbox 6.0:1	\$42.50
Dual Box 4.3:1, 5.0:1, 6.0:1	\$61.50

DEALER INQUIRIES WELCOME



LATEST PRODUCT RELEASES



STERLING MODELS **X-Wing Fighter**

This 13-inch-span control-line model of a *Star Wars* rebel fighter is easy to build and features slot-and-tab construction. The model uses a Cox .049 engine for power.

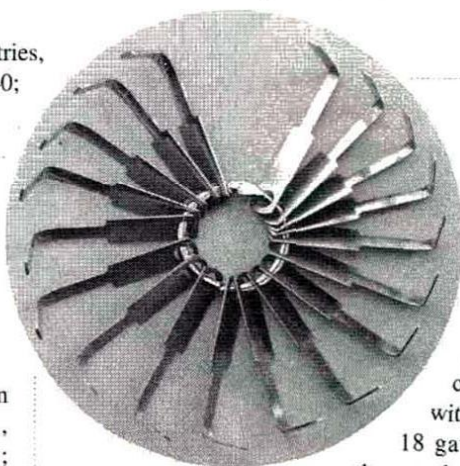
Part no.—STE 6760; **price**—\$26.99.

Sterling Models; distributed by Estes Industries, P.O. Box 277, 1295 H St., Penrose, CO 81240; (719) 372-6565; fax (719) 372-3419.

JR REMOTE CONTROL **XP642 Radio**

This 6-channel sport radio features 4-model memory, exponential control and programmable mixing, and it comes with four ball-bearing servos, a 600mAh transmitter battery and a 1000mAh receiver pack.

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; website: <http://www.horizonhobby.com>.



KEELEY'S CUSTOM MOTOR WORKS **Head Gauges**

To improve performance and operation, measure your engine's head clearance (the distance between the piston at top dead center and the cylinder head) quickly and accurately with these head gauges. Each set includes 18 gauges from 0.010 to 0.035 inch, and they can be used on .21- to .90-size engines.

Price—\$19.95.

Keeley's Custom Motor Works; distributed by G&M Models, P.O. Box 6342, Broadview, IL 60153; (630) 279-2451.

PILOTS BY DIANE **1/8- to 1/3- scale Pilot Figures**

These authentic pilot figures are hand-painted and feature hand-made clothing. They come in

sport, civilian and military outfits and as busts and full-length figures. Pilots can also be made to special order.

Prices—from \$20 to \$100.

Pilots by Diane Chevalier, P.O. Box 1865, Champlain, NY 12919; (514) 246-4543.

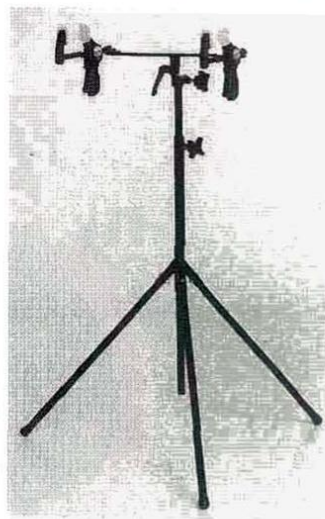


ORR PRODUCTS **Hobby Stand**

Work on your plane comfortably at any height with this all-steel powder-coated hobby stand. It can be adjusted from 30 to 60 inches, rotates 360 degrees, tilts 180 degrees forward and backward and can be adjusted for tapered fuselages. Two adjustable Quick Grip bar clamps hold your model firmly in position.

Price—\$109.95 plus \$9.95 S&H (IA residents add 5% sales tax).

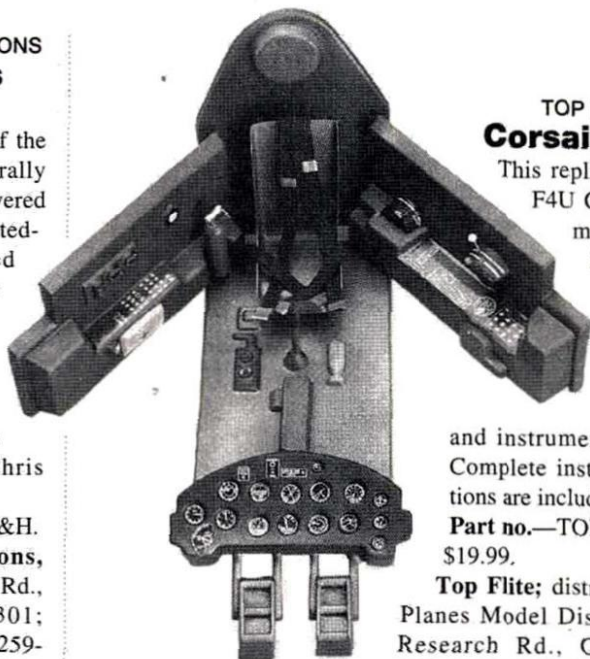
Orr Products, 100 C St., New Market, IA 51646.



SKS VIDEO PRODUCTIONS **Florida Jets Video**

This 90-minute video of the first-ever Florida Jets rally features 14 turbine-powered models and lots of ducted-fan action. Featured planes include Felix Pinon's BAe Hawk, Malcom Kay's T-33, Geoff Wallace's Saab Viggon, Joe Pasztor's F-9F, Eric Rantet's Mirage 2000 and Chris Slade's AV-8B Harrier.

Price—\$24.95 plus \$3 S&H. **SKS Video Productions**, RD #1, Box 264, Pine Rd., Abbottstown, PA 17301; (800) 988-6488, (717) 259-7193; fax (717) 259-6379; email sksvideo@cyberia.com; website: <http://www.yorkpa.com/sks>.



TOP FLITE **Corsair Cockpit**

This replica of a full-size F4U Corsair cockpit is made of precision-formed styrene and features realistic touches such as elastic seat belts and instrument panel decals. Complete installation instructions are included.

Part no.—TOPQ8404; **price**—\$19.99.

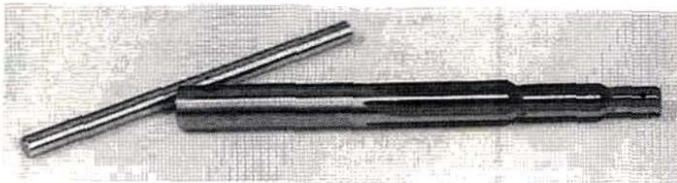
Top Flite; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax

(217) 398-0008; website: <http://www.hobbies.net/topflite>.

ISC INTL. **Expert Reamers**

Made of durable, high-speed steel, these stepped reamers feature a 1/4-inch pilot shaft. They're sized in 7-, 8- and 10mm for the metric reamer and 1/4-, 5/16- and 3/8-inch for the standard reamer. Each features a removable T-handle that allows you to chuck the reamers in a drill press.

ISC Intl., P.O. Box 40116, Indianapolis, IN 46240; (317) 844-1978.



AUTOGYRO CO. OF ARIZONA **1923 Cierva C.4 Plans**

This single-rotor, direct-control 1/8-scale autogyro uses any sport .40 engine and a 4-channel radio for throttle, rudder, elevator and rotor head "tilt." A full materials list, construction manual, balance/track instructions and preliminary flight instructions are included.

Price—\$30.

Autogyro Co. of Arizona, 3307 W. Renee Dr., Phoenix, AZ 85027; phone and fax (602) 582-9428; email giroman@prodigy.net.



PICA ENTERPRISES INC.

Gluit 2-it

This high-performance, acrylic, co-polymer emulsion can glue balsa to any fiberglass, plastic or foam.



Price—\$3.89 for an 8-ounce bottle.

Pica Enterprises Inc., 2675 NE 188th St., Miami, FL 33180; (305) 932-8008; fax (305) 937-2322.

Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by Model Airplane News, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in Model Airplane News. Manufacturers! To have your products featured here, address the press releases to Model Airplane News, attention: Product News, Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606.

Name **THAT PLANE**

CAN YOU IDENTIFY THIS AIRCRAFT?

H.G. Frautschy of Oshkosh, WI. correctly identified the June '97 mystery plane as the Jupiter Jamieson.

Congratulations; this one was tricky! This three-place cantilever monoplane featured alclad aluminum construction and retractable tricycle landing gear, was 20 feet, 10 inches long and had a 29-foot wingspan. In the original ad for the aircraft, the Jamieson Aircraft Co. of Deland, FL, boasted that it had "unbelievably short takeoff runs ... [and] landing runs you'll have to see to believe."

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.



With a Lycoming 115hp engine in its nose, the Jupiter had a cruising speed of more than 150mph at sea level with a full load of 800 pounds and a range of 700 miles. When the airplane was released in 1949, it cost only \$2,500. ✈

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

HOW-TO ARTICLES WANTED

Do you have a construction technique, building method, or design innovation that you'd like to share with readers?

Why not publish your ideas in *Model Airplane News*?
For more information, contact Debra Sharp (203) 834-2900.

CVEC Power System™

Universal systems now available for R/C planes, boats, cars...

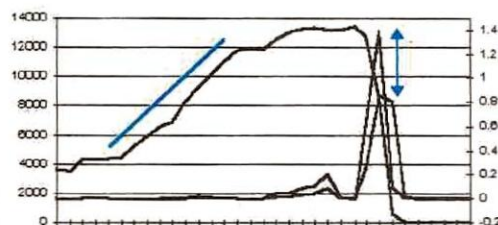


Break the two-cycle performance barrier... less than 1/2 the size of a tuned pipe

Dynamometer tests on hobby scale engines prove its ability to:

- Decrease engine ramp-up time
- Provide more torque and horsepower
- Control noise emissions

**Satisfaction Guaranteed
or your money back**
Guarantee Subject to Conditions



<http://www.innoventive.com> • (800) 529-1919

Innoventive Technologies, Inc • 16025 23 Mile Road • Macomb Twp, MI 48042

CLASSIFIEDS

BUSINESS

SCALE AIRCRAFT DOCUMENTATION and resource guide. Larger, updated 1997 edition. World's largest commercial collection. Over 6,400 different color Foto-Paks and 35,000 three-view line drawings. 204-page resource guide/catalogue—\$8; Canada—\$10; foreign—\$15. Bob Bank's Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626; (714) 979-8058. [9/97]

RUSSIAN AVIATION AND SPACE HISTORY. For sale: photographs—color or black & white (any size, available framed or unframed) with original signatures of Russian cosmonauts and without (signatures are original, but reproduction). Envelopes with postage stamp, which put on the Baikonur (Russian Cape Canaveral) with original signatures of Russian cosmonauts and without. Autographs guaranteed genuine. 40-year collection of lapel pins, tie tacks, medals (about 1,700, including rare samples)—Soviet aviation and aerospace. Schemes of airplane models such as IL-2, IL-12, IL-76, IL-114, AN-8, AN-12, AN-22 and some others in a scale of 1/2 with all necessary cross-sections. Excellent handcrafted aircraft models of AN-2 and IL-76 (scale 1/2). Gramophone records with original signatures of Russian cosmonauts (voices of Y. Gagarin, S. Korolev, and K. Tsibulsky). Consultations about Soviet Union and Russia aircraft and space history. SETNA Consulting Co., 1041 N. Stanley Ave., #6, Los Angeles, CA 90046. Phone/Fax (213) 656-0387. [9/97]

BUILDING SERVICE. Trainers to jets! We build them. You fly them. We are at the leading edge of R/C aircraft assembly technology. (407)359-5387; (407) FLY-JETS. We specialize in trainers, sport, scale, giant scale & jets. www.iag.net/aircraft, or email aircraft@iag.net. [9/97]

AERO FX BY JO DESIGNS—exact-scale, computer-cut, high-performance vinyl graphics and paint masks. Lettering; nose art; insignia for scale; pattern, pylon and sport fliers; complete graphic sets available. Call or write for free sample and catalogue. JO Designs, Rt. 1, Box 225 AA, Stratford, OK 74782; (405) 759-3333; fax (405) 759-3340. [11/97]

GIANT SCALE PLANS BY HOSTETTER. Send SASE to Wendell Hostetter's Plans, 1041 Heatherwood B, Orrville, OH 44667. Phone (330) 682-8896; fax (330) 683-5357; http://www.aero-sports.com/whplans [6/98]

SODA-CAN AIRPLANES—replica biplane detail plans with photos \$7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/98]

AFFORDABLE CNC MILL. Sherline Retrofit. Complete and ready to use. For information: (847) 998-0821. [9/97]

REPLICA SWISS WATCHES—18KT gold-plated! Lowest prices! Two-year warranty! Waterproof divers, chronographs, others! Phone (770) 682-0609; fax (770) 682-1710. [9/97]

SUNGLASS DISCOUNTS—Serengeti, RayBan, Randolph, Vuarnet, Gargoyles, Bolle, Revo, Hobie. Free catalogue. FJS Accessories (800) 226-7571. [9/97]

GEE BEE PLANS used for full-scale R-2, "Z" Ten airplanes, 1/2-1/4. Catalogue/News \$4. Vern Clements, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608 [9/97]

LARGE-SCALE SAILPLANES AND TOWPLANES—new and used—call (212) 879-1634, Sailplanes Unlimited, 63 East 82nd St., New York, NY 10028. www.sailplanes.com [11/97]

R/C SKYDIVING: Thrilling free-falls, chute opens by transmitter. Parafall Parachute duplicates all canopy maneuvers, turns, stalls, spirals, landing flares, etc. Latest catalogue \$1. R/C Skydivers, Box 662M, St. Croix Falls, WI 54024. [9/97]

PLANS—R/C sailplanes, scale, sport and electric. Old-timer nostalgia and FF scale and sport-powered, rubber and towline. All models illustrated. Catalogue \$2. Cirrus Aviation, P.O. Box 7093, Depot 4, Victoria, BC V9B 4Z2 Canada. [9/97]

MAKE REAL DECALS with your computer and printer. Send \$10 for introductory kit to LABCO, Dept. MAN, 27563 Dover, Warren, MI 48093. http://www.mich.com/labco/ [9/97]

NEW ZEALAND AERO PRODUCTS. Scale plans: Agwagon, Airtruk/Skyfarmer, Pawnee, Pawnee Brave, Fletcher FU-24, DC-3/C-47, Cessna 152 Aerobat, Hall's Springfield Bulldog, Fairchild PT-19, Fleet PT-26, Rearwin Sportster, Typhoon and more. Hardware packs, color photo packs available. Free documentation with plans. Catalogue/Price List: \$5 (U.S.); Visa/MC. 34 Ward Parade, Stirling Point, Bluff, New Zealand. Phone/24 hr. fax: 643-2128192. [3/98]

WW I PLANS. Over 600 in stock. Laser-cut parts. Printed lozenge tissue. Send \$5.00 for illustrated catalogue to Clarke Smiley, 23 Riverbend, Newmarket, NH 03857. [10/97]

FLYRITE BUILDING SERVICE. Experience in fine detail and craftsmanship of any kit. Top Flite, Great Plans, Midwest, Goldberg, Sig, etc. From box to air. (513) 755-8894. [2/98]

SAITO ENGINE REPAIRS. Now available at A-Train Hobby by the Oldtimer. Other gas engine repairs also available. A-Train Hobby, 13503B Southeast Mill Plain Blvd., Vancouver, WA 98684; (360) 944-5403. [11/97]

PRESSURE JET ENGINE GLUHAREFF G8-2 5 lbs. to 40 lbs. thrust, plus. Push-button starting. No moving parts. Propane powered. Successful multiple uses. 16 page illustrated catalogue \$5.00. Jet Wind Company, 1624 Burnett St., Long Beach, CA 90806. (562) 427-2655, (213) 258-9313; Fax (562) 427-3126. [11/97]

LANDING GEAR PLANS: Build functional, spring-loaded gear for any size model. Send \$7.50 shipping and handling to Jesse Lyon, 693 Park Rd., Morris Plains, NJ 07905. You will never use conventional gear again! [9/97]

FASTENER ASSORTMENT BY PETE'S PARTS: Select the assortment of fasteners that best suits your needs. Call, or fax for free catalog. (888) 657-2167, fax (616) 657-6299. [10/97]

C/TEC BUILDING SERVICE: Proctor, Sig, Balsa USA, Goldberg, etc. Build to any stage of construction. Quality is our most important product. Redmond, OR, (541) 504-4638. [10/97]

AIR SPEED INDICATOR. This unit measures the highest speed achieved by your model during flight and reports the information after landing. Lightweight & accurate. Write or call for information and pricing: Hobbytech Inc. 34 Joslyn Dr., Elgin, IL 60120. Phone/fax (847) 695-5903. hobbytech@juno.com. [9/97]

PINS, PATCHES, BADGES: Club memorabilia, embroidered emblems, hats, hat tacs, name badges, placards, signs and awards. Generation Products Company (800) 472-5155. [8/97]

DELUXE AIRPLANE MODELERS TOOL CHEST: two knife handles, five assorted blades, razor saw blade, two screwdrivers, pinpoint stylus, large clamp, small clamp, one curved hemostat, miter box, sander block in wooden box. Send \$30 plus \$4.50 S&H to JD & Son Inc., P.O. Box 234, Lemont, IL 60439; (800) 821-1821. We accept Visa and MasterCard. [9/97]

DETHERMALIZING CERTAINTY. For most free-flight models. Weighs .7 to 1.2 grams. Large SASE to Wheels & Wings, P.O. Box 762, Lafayette, CA 94549-0762. [10/97]

HELICOPTER SCHOOL: Five days of hands-on instruction with X-Cell helicopter and Futaba and JR Radios. Small classes, tailored to meet your individual needs, beginning to experts. Includes all meals and lodging. Over 520 satisfied students from 23 countries and 44 states, logging 20,000 flights in the last seven years. Located on a 67-acre airport used exclusively for R/C training. Owned and operated by Ernie Huber, five-time national helicopter champion and designer. Send for free information and class schedule NOW! R/C Flight Training Center, P.O. Box 727, Crescent City, FL 32112; (800) 452-1667; Fax (904) 698-4724. Outside of U.S. (904) 698-4275. www.RCHELICOPTER.COM. [11/97]

NORTHWEST AG AIRCRAFT is the U.S. agent for New Zealand Aero Products' fine line of scale plans, documentation, and new fiberglass accessories. Call or write for a catalogue of these award-winning Ag aircraft and many more! Only \$5. Route 4, Box 575-28, Astoria, OR 97103; phone/fax (503) 458-6686. [9/97]

MAKE YOUR OWN ROCKET MOTORS!!! Homemade solid and composite fuels power R/C gliders, model rockets, etc. Smoke tracers for R/C planes & choppers, electric igniters, cannon fuse "chemicals," lab acids, glassware, "How-to" Books, videos, rocket motor kits "huge" catalogue \$2. Pyrotek, P.O. Box 300, Sweet Valley, PA 18656; (717) 256-3087. [2/98]

ELIMINATE CARBON, VARNISH AND OVERHEATING PROBLEMS and reduce engine wear with QX-500 R/C Fuel Treatment. Send \$1 or 3 stamps for sample. LubeTech, 10620 Nevada St., Melrose Park, IL 60164. [11/97]

PLANS ENLARGING SOFTWARE—PLANS ENLARGING. Old magazines, scanning, plotting. Free information. Concept, Box 669A, Poway, CA 92074; (619) 486-2464. [11/97]

WE BUY, SELL & TRADE—ALL ENGINES, PARTS, 4-CYCLE & IGNITION. latest arrivals: Proctor sopwith camel WW-I Bipe: Ultra scale w/ plans, Fabric covered- \$475; Ace R/C-7 Ch. single stick, 16 servos, 3 receivers, 2 Ni-Cd packs—CH 18- net-\$240 send \$2 & #10 double stamped SAE for latest bargain bulletin of rare items to: Carl V. Miller, 1773 Blueberry Dr. N.E., Rio Rancho, NM 87124. Phone (505) 891-1298. [9/97]

B.U.B.A.: (Built-Up Beginners Airplane) Learn to fly R/C with < \$150. Easy to fly. Kits \$29.95. For free brochure: Erbach R/C, 3507 King St., Regina, SK, Canada S4S 2J2. [9/97]

HOBBYIST

MAGAZINE BACK ISSUES—American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM and more, 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [9/97]

WANTED: Built or partially built scale Cessna 150, 152, or 172. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; phone (714) 768-0585; fax (714) 458-6455. [10/97]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/97]

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send \$3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537. [11/97]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952, "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. \$1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C., Canada V0R 1L1.

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [3/99]

USED ENGINES WANTED. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089. [8/97]

FUTABA FP-7UAP Super 7 PCM 1024 radio control. Complete system. Modern condition. \$325. Call Joe at (203) 661-6532. [9/97]

FOR SALE: Winch with brake, foot switch, turnaround, about 2,000 ft of line, parachute, stakes, maintenance-free battery with bladeswitch. \$350. (541) 382-1498. [10/97]

WANTED COX GAS POWERED: cars, planes, boats. Paying \$50 each. Dean Barham, 4032 Iowa, San Diego, CA 92104; 619-528-1680. [11/97]

HELICOPTER ENGINE. OS61SFN-H. Perfect \$149. Andre (601) 856-2339. [9/97]

WANTED: WW II Righter Target Drone engines, parts, manuals. Ed Fisher, 27 Hurdle Fence, Avon, CT 06001; (860) 675-5676. [9/97]

FOR SALE: Over 300 issues of *Model Airplane News*. 1930s to 50s. Most Excellent. All-Asking \$925.00. John Laughlin, (601) 467-2984. [9/97]

PAYING \$150 EACH FOR TOY OUTBOARD MOTORS: Mercury, LePage, Orkin, Oliver, Scott, Fuji, Sea-Fury Twin, Evinrude, Gale, Johnson, Gronowski, 140 N. Garfield Ave. Traverse City, MI 49686; (616) 941-2111. [11/97]

WANTED: Futaba single stick helicopter radio. Complete system or transmitter only. PH 814-825-8404. Bob Vomero. [2/98]

EVENTS

RELIVE 30 SECONDS OVER TOKYO!! Your chance to own a fabulous twin engine B-25 made by Wing Manufacturing! A dream prize worth more than \$1,500 consisting of this fantastic kit complete with engine and machine gun details, two (2) Saito Gold Knight .56 4-stroke engines, JR XP642 Computer Radio, complete Robart pneumatic retract system, Coverite aluminum covering, Du-Bro wheels and hardware package will be raffled at the Midwest's largest R/C Swap Shop and newest EXPO! This event is sponsored by the Hobbytime Flyby Knights, AMA 3763, on Sunday, October 26th, 1997, in the main exhibition hall at the DuPage county Fairgrounds, Wheaton, Illinois. Raffle tickets are \$1 each or 6/\$5. Raffle or admission tickets may be purchased by mail/phone/FAX or in person at the EXPO. Credit cards accepted for tickets or Exhibit Spades. Call (630) 837-8437/fax: 7239 or mail your order to Hobbytime Flyby Knights, Hangar 369, 369 Army Trail Rd., Bloomingdale, IL 60108. Winner need not be present. [11/97]

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial—50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. All ads must be paid for in advance. To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., January 10 for the April issue. We don't furnish box numbers, and it isn't our policy to send tear sheets. Please make all checks and money orders in U.S. funds, payable to: AIR AGE, INC. SEND AD AND PAYMENT TO: CLASSIFIED ADS, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 or call (203) 431-9000.

We've Done it Again!

** Innovation at its finest **

NEW

E/Z Threader

Cal. No. 725

*Great for the field box or workshop
for installations and final adjustments!
(small enough to use inside fuselage)*

Made in USA

DU-BRO

A Name You Can Count On.

847-526-2136, email: du-bro@ix.netcom.com

P.O. Box 815, 480 Bonner Rd.
Wauconda, IL 60084

The 3-in-1 Installation Tool!



**1. Thread Nylon
Kwik-Links**



**2. Thread
Ball Links**



**3. Thread Swivel
Ball Links**

INDEX OF MANUFACTURERS

21st Century;
distributed by Coverite (see
address below).

Ace R/C Inc.,
116 W. 19th St., P.O. Box 472,
Higginsville, MO 64037-0472;
(816) 584-7121; orders (800)
322-7121; fax (816) 584-7766.

Aerofoam,
1913 East El Parque, Tempe,
AZ 85282; (602) 968-6007;
email aerofoam@earthlink.
net/~aerofoam/.

APC Props;
distributed by Landing Products,
P.O. Box 938, Knights Landing,
CA 95645; (916) 661-0399.

Balsarite;
distributed by Coverite (see
address below).

B-Squared Streamlines,
P.O. Box 975,
Olalia, WA 98359-0975;
email bsquared@halcyon.com;
website http://www.halcyon.
com/bsquared.

Bob Holman Plans,
P.O. Box 741, San Bernardino, CA
92402; (909) 885-3959;
fax (909) 889-9307.

Carl Goldberg Models,
4734 W. Chicago Ave., Chicago,
IL 60651; (312) 626-9550;
fax (312) 626-9566.

Combat Models R/C Jets,
8525-K Arjons Dr., Miramar, CA
92126; (619) 536-9922;
fax (619) 536-1028;
email CBMJets@aol.com;
website http://members.aol.com
/cbmjets/homepage/CBM.html.

Coverite;
distributed by Great
Planes Model Distributors,
P.O. Box 9021, Champaign, IL
61826-9021; (217) 398-1104; website
http://www.hobbies.net/dynafite.

Dave Brown Products,
4560 Layhigh Rd., Hamilton,
OH 45013; (513) 738-1576;
fax (513) 738-0152; website
http://www.dbproducts.com.

Desert Aircraft,
P.O. Box 18038, Tucson, AZ
85731; (520) 722-0607;
fax (520) 722-0607.

Dream Catcher Hobby Inc.,
P.O. Box 77, Bristol, IN 46507-
0077; (219) 848-1427; email
DCHobby@Skyenet.net; website
http://www.dchobby.com.

Du-Bro Products,
P.O. Box 815,
Wauconda, IL 60084;
phone/fax (815) 455-9280.

Fox Mfg.,
5305 Towson Ave., Fort Smith,
AR 72901; (501) 646-1656;
fax (501) 646-1757.

Futaba Corp. of America,
P.O. Box 19767, Irvine, CA
92723-9767; (714) 455-9888;
fax (714) 455-9899.

Great Planes Model Distributors,
2904 Research Rd.,
P.O. Box 9021, Champaign, IL
61826-9021; (217) 398-6300;
fax (217) 398-1104; website
http://www.hobbies.net/dynafite.

Harry Higley & Sons, Inc.,
P.O. Box 532, Glenwood, IL
60425; (708) 755-8774.

Hirobo;
distributed by Altech Marketing,
P.O. Box 7182, Edison, NJ
08818-7182; (908) 225-6144.

Hitec/RCD Inc.,
10729 Wheatlands Ave., Ste. C,
Santee, CA 92071-2854; (619)
258-4940; fax (619) 449-1002.

House of Balsa,
10101 Yucca Rd., Adelanto, CA
92301; (760) 246-6426;
fax (760) 246-8769.

JR Remote Control;
distributed by Horizon Hobby
Distributors, 4105 Fieldstone Rd.,
Champaign, IL 61821; (217) 355-
9511; fax (217) 355-8734.

Lite Machines,
1291 Cumberland Ave., Unit H,
West Lafayette, IN 47906; (765)
463-0959; fax (765) 463-7004.

Midwest Products,
P.O. Box 564, Hobart, IN
46342-0564; (800) 348-3497;
fax (219) 947-2347.

Model Products Corp.,
5 Dallandra Dr., P.O. Box 100,
Allamuchy, NJ 07820; (908) 850-
1508; fax (908) 850-8860.

MonoKote;
distributed by Great Planes Model
Distributors (see address above).

Morris Hobbies,
4200A Leghorn Dr., Louisville, KY
40218; 800-826-6054; (502)
451-0901; fax (502) 451-8793.

MVVS Corporation of America,
7 Switchbud Pl., #192-211,
The Woodlands, TX 77380; (281)
364-8011; fax (281) 298-7032.

Nelson Aircraft Co.,
21550 N.W. Nicholas Ct., Unit D,
Hillsboro, OR 97124; (503) 629-
5277; fax (503) 629-5817.

Northeast Sailplane Products,
16 Kirby Ln., Williston, VT 05495;
phone/fax (802) 658-9482;
email salnsp@together.net;
website http://www.nesail.com.

O.S.;
distributed by Great
Planes Model Distributors,
P.O. Box 9021, Champaign, IL
61826-9021; (217) 398-6300;
fax (217) 398-1104.

Pacer Technology,
9420 Santa Anita Ave.,
Rancho Cucamonga, CA 91730;
(909) 987-0550;
toll-free (800) 538-3091.

Patterick's Inc.,
P.O. Box 2031, Glenwood
Springs, CO 81602;
(800) 331-1899; email
73774.3530@compuserve.com.

Rony Mfg. Inc.,
110 Monda Way, Blue Lake,
CA 95525; (707) 668-1667;
fax (707) 668-5913.

Royal Products Corp.,
790 W. Tennessee Ave., Denver,
CO 80223; (303) 778-7711;
fax (303) 778-7721.

Sherline Products Inc.,
170 Navajo St., San Marcos, CA
92069-2593; (800) 541-0735;
fax (760) 744-1574.

Sig Mfg. Co. Inc.,
P.O. Box 520, Montezuma, IA
50171; (800) 247-5008 (order
only); fax (515) 623-3922.

Sullivan Products,
P.O. Box 5166, Baltimore, MD
21224; (410) 732-3500;
fax (410) 327-7443.

TLAR Enterprises,
1039 NE 133 St., Seattle, WA
98125; (206) 363-7559.

Trick R/C,
938 Victoria Ave., Venice, CA
90291; (310) 301-1614;
email zod@zagi.com; website
http://www.zagi.com.

Ultracote;
distributed by Carl Goldberg
Models (see address above).

Yellow Aircraft,
200 Massachusetts Ave.,
Lexington, MA 02173; (617) 674-
2222; fax (617) 674-2188.

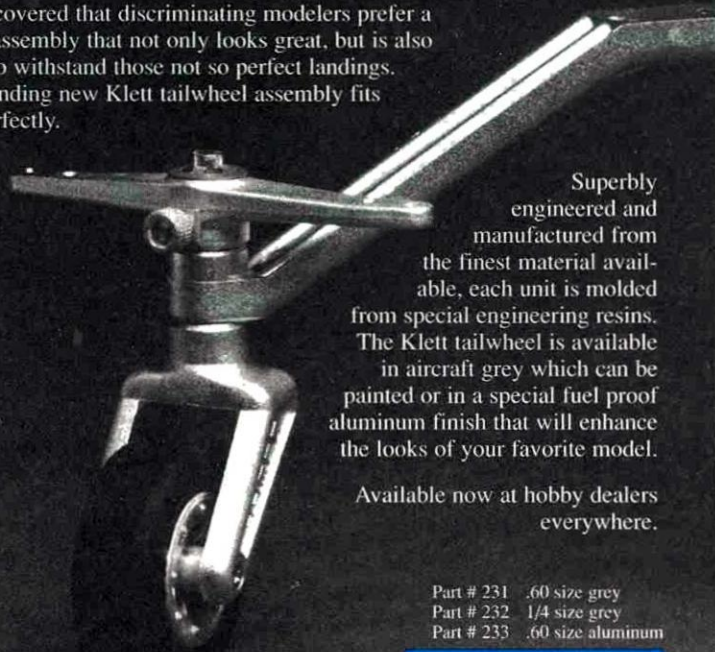
Walter Bub,
412 Clubhouse Rd., Lebanon, CT
06249; (860) 642-7403.

ADVERTISER INDEX

Adventure Products.....115	Dave Brown Products.....107	K&B Manufacturing.....121	Precision Micro Electronics.....123
Aerial Dynamics.....81	Davis Instruments.....84	K&S Engineering.....123	Propwash Video.....101
Aerospace Composite Products.....121	Desert Aircraft.....61	Kerr Aircraft.....119	ProSpark.....114
Aerotrend.....96	DJ Aerotech.....123	Kress Jets, Inc.....120	RCHTA.....99
Air Capital Hobbies.....114	Dodgson Designs.....119	Kyosho.....80	Robert Manufacturing.....118
Airplane Factory.....109	Don Smith Plans.....124	Lanier RC.....33	Rocket City Specialties.....141
Airtronics.....5	Du-Bro Products.....142	LDM Industries.....94	Scale Specialties.....121
Airtronics.....131	Dymond Modelsport USA.....78	MacCim Motors, Inc.....126	SG Corporation.....62
Altech.....C2	Dynaflite.....143	Major Decals.....125	Sherline Products.....77
Ambrosia Microcomputer.....113	Electro Dynamics.....114	Major Hobby.....95	Sig Manufacturing Co.....17
America's Hobby Center, Inc.....74-75	Erickson Motors.....122	MAT.....126	SKS Video Productions.....94
Arizona Model Aircrafters.....114	Estes Industries.....99,115	Micro Fasteners.....119	Sky, Inc.....124
Autogyro Company of Arizona.....118	Flitecraft.....35	Micropace.....94	Slimline.....99
Aveox Electric Flight.....113	Florida Enterprises.....86	Miller R/C Products.....120	Smithy.....115
Balsa USA.....85	Futaba.....C3	Model Airplane News Classifieds.....148	SR Batteries.....73
Bob Smith Industries.....9	Gerard Enterprises.....101	Model Airplane News	Sullivan Products.....79,81
Byron Originals, Inc.....38	Global Hobbies.....10	Pilots' Mart.....127-130	Swanson Associates.....141
C.B. Tatone.....115	Great Planes.....87	Model Covering Company.....118	Technopower II.....114
Cabral Systems, Inc.....114	Hayes Products.....120	Model Electronics Corp.....112	Thunder Tiger.....15,67,C4
Cactus Aviation.....125	Hilyard Products.....107	Morris Hobbies.....19	TNC Electronics.....141
Carden Aircraft.....119	Hitec.....7,31	Mud Duck Aviation.....120	TNR Technical.....109
Carl Goldberg Models, Inc.....144	Hobby Lobby International, Inc.....137	Multiplex USA.....122	Top Flite.....21
Carlson Engine Imports.....121	Hobby Shack.....116-117	MVVS Corporation of America.....115	Tower Hobbies.....90-93
Cermark Model Supply, Co.....133	Hobby Warehouse	Nelson Aircraft, Co.....120	Trillium Balsa.....125
Chase-Duror.....4	of Sacramento.....138-139	North American Power R/C.....119	Trinity.....3
Clancy Aviation.....118	Horizon Hobby Distributors.....88-89	Northeast Hobby Products Co.....63	Tru-Turn.....126
Cleveland Model & Supply.....94	Hyperformance Products.....124	Norvel.....68-69	Universal Laser System.....113
Combat Models.....113	Innosol.....119	O.S. Engines.....135	US Engines.....84
Composite Aircraft Technologies.....125	Innovative Model Products.....121,123	Orr Products.....107	Vailly Aviation.....125
Composite Structure Technology.....101	Innoventive Technologies, Inc.....136	Pacific Aeromodel Mfg.....107	Varsane Products.....120
Computer Designs.....125	ISC International.....96	Palmer Plans.....126	Vintage R/C Plans.....120
Coverite.....86	J&K Products.....84	Paul K. Guillo.....109	Windsor Propeller.....59
Cox Hobbies.....43	Jet Hangar Hobbies, Inc.....122	Peck Polymers.....118	World Class, Inc.....96
Critter Bits.....122	JK Aerotech, Inc.....126	Plane Talk.....118a	Zap Glue.....13
Dare Hobby Distributors.....53	Junior Custom Products.....101	Polk's Modelcraft hobbies.....145	

Great Tailwheels!

We've discovered that discriminating modelers prefer a tailwheel assembly that not only looks great, but is also designed to withstand those not so perfect landings. The outstanding new Klett tailwheel assembly fits the bill perfectly.



Superbly engineered and manufactured from the finest material available, each unit is molded from special engineering resins. The Klett tailwheel is available in aircraft grey which can be painted or in a special fuel proof aluminum finish that will enhance the looks of your favorite model.

Available now at hobby dealers everywhere.

Part # 231 .60 size grey
Part # 232 1/4 size grey
Part # 233 .60 size aluminum

**CARL GOLDBERG
MODELS INC.**

MODEL AIRPLANE NEWS (ISSN 0026-7295, USPS 533-470) is published monthly by Air Age Inc., 100 East Ridge, Ridgefield, CT 06877-4606. Copyright 1997; all rights reserved. The contents of this publication may not be reproduced in whole or in part without the consent of the copyright owner. Periodical postage permit paid at Ridgefield, CT, and additional mailing offices.

SUBSCRIPTION INFORMATION. Call (800) 827-0323. U.S.: \$39.95 for one year, \$59.95 for two years. Canada: \$56.66 for one year, \$91.97 for two years (Canadian prices include G.S.T.). Elsewhere: \$52.95 for one year, \$85.95 for two years. Canadian G.S.T. registration no. 13075 4872 RT. To subscribe electronically, set your Web browser to <http://www.airage.com/subscribe.html>.

EDITORIAL. Send correspondence to Editors, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606. INTERNET: man@airage.com. We welcome all editorial submissions, but assume no responsibility for the loss of or damage of unsolicited material. To authors, photographers and people featured in this magazine: all materials published in Model Airplane News become the exclusive property of Air Age Inc., unless prior arrangement is made in writing with the Publisher.

ADVERTISING. Send advertising materials to Advertising Dept., Model Airplane News, 100 East Ridge, Ridgefield CT 06877-4606; phone (203) 431-9000; fax (203) 431-3000.

CHANGE OF ADDRESS. To make sure you don't miss any issues, send your new address to Model Airplane News, P.O. Box 428, Mount Morris, IL 61054-9853, six weeks before you move. Please include the address label from a recent issue, or print the information exactly as shown on the label. The Post Office will not forward copies unless you provide extra postage.

POSTMASTER. Please send Form 3579 to Model Airplane News, P.O. Box 428, Mount Morris, IL 61054-9853.

MICRO-AERIAL VEHICLE COMPETITION

R/C modelers love to design, build and fly airplanes. R/C model design is a perfect example of how one can combine rule-of-thumb ideas and common sense to arrive at designs that not only work, but work well! Modeling allows us to test new ideas easily without the expense and danger associated with flight testing full-scale, manned aircraft. But what happens when you tackle a new problem that falls outside of your experience base? This is exactly what happened to Greg Bartz and I when we accepted the challenge of designing and building the world's smallest aerial reconnaissance airplane for the 1st annual Micro Aerial Vehicle (MAV) competition hosted by the University of Florida.

Model airplanes have been more a way of life for us than a hobby. Greg and I didn't meet at the flying field. Instead, we met at Mississippi State University's College of Aerospace Engineering. The MAV competition provided an ideal opportunity for us to combine our practical R/C experience with our engineering environment.

The mission was to design the smallest airplane that could fly a distance of 600 meters (about 2,000 feet) and cap-

model to perform as well as its full-scale counterpart without making small, but necessary, changes to account for the fact that inertial and aerodynamic forces do not scale equally.

This caused us to think that shrinking an existing design was not the route to take; a new, unconventional design would most likely be the best answer. So how do you obtain a feasible design when there are so many unknowns involved? Where do you start? The answers to these questions hinge upon the competition's second requirement: that the airplane be designed using a Multidisciplinary Design Optimization methodology (MDO).

MDO is a new method used in the aerospace industry for optimizing complex systems like airplanes. Basically you allow the computer to change each design variable, e.g., wingspan, chord length, tail area, engine size, until it has minimized the objective, which in our case was size (longest linear dimension between any two points on the airplane).

The method follows constraints that ensure the final design will actually fly and complete the mission.

A good example might be a constraint that would make the wing loading less than or equal to 1 pound per square foot. Since the computer wants to minimize the size of the airplane, it would try to drive the wing area to zero. However, if the computer estimated the airplane's weight to be 1.5 pounds, the program would be forced to keep the wing area above 1.5 square feet or violate the constraint imposed upon it. Because of the number of design variables and constraints, it took several days for the computer to deliver a reasonable solution. Once finished, however, we had plans for the smallest airplane (26 inches maximum dimension)

to compete in the MAV competition.

But would it fly? A three-month time constraint had us completing the design/build portion of the requirements three days before the competition, which left little margin for error in the flight testing phase.

There were many idiosyncrasies that surfaced during the post-MDO verification of our design. It turns out that our analysis showed us the odd traits of an extremely low aspect ratio, short-coupled, low-Reynolds-number biplane design. We were forced to choose whether to believe our analysis or our instincts. Luckily, we decided to trust our calculations and, as it turned out, our micro-reconnaissance airplane possessed exceptional flying qualities and matched the estimated performance exactly.

Only two of the six participants completed the mission. We won the Best



MDO Award, but our plane suffered from a faulty hand launch, which removed it from flight competition. Steve Morris of MLB in Palo

Alto, CA, won by being the only participant to satisfy both the mission and MDO requirements.

This competition revealed limitations associated with current technology. All the planes that flew were not much smaller than the smallest R/C plane at your local club. With MDO, we can continue to shave off a few inches to achieve a smaller airplane, but the evolution of really micro aircraft will be more dependent on smaller propulsion and control systems. Additional information about our design and MDO can be obtained at <http://www.aero.ufl.edu/~get/issmo/uav/uav.htm>.

—George Hicks & Gregory Bartz ✦



ture an image of a 5-square-foot symbol on the ground. Seems simple enough; but have you ever really thought about what happens when you try to shrink an airplane? Sure you have, because that's what modeling is all about. We all know that you can't get an exact 1/6-scale